

SUPPLEMENT.

The Mining Journal, RAILWAY AND COMMERCIAL GAZETTE:

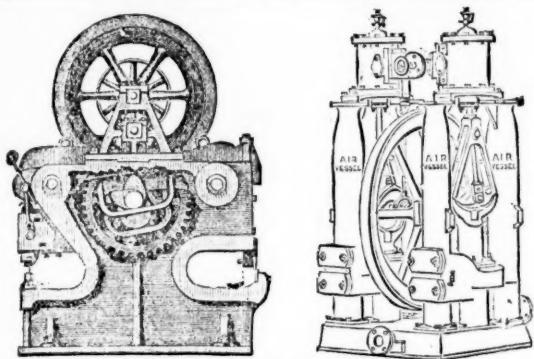
FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

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No. 2007.—VOL. XLIV.

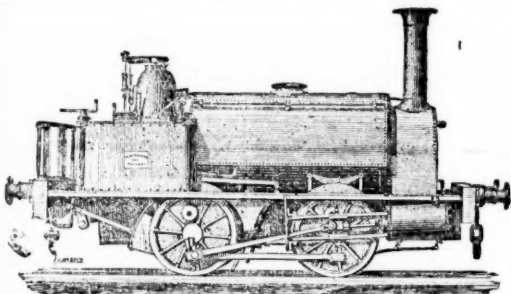
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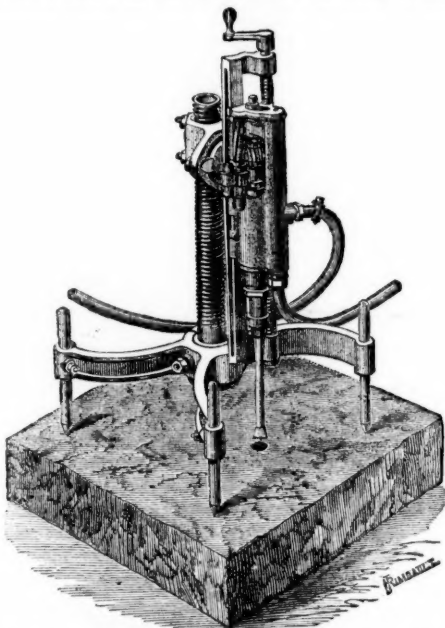
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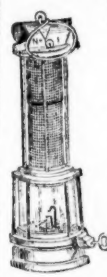
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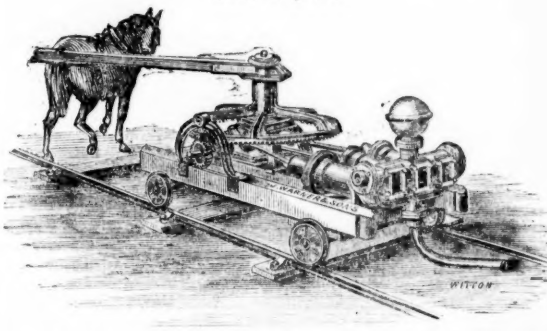


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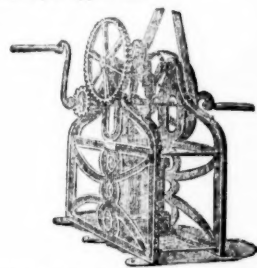
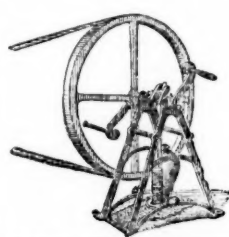
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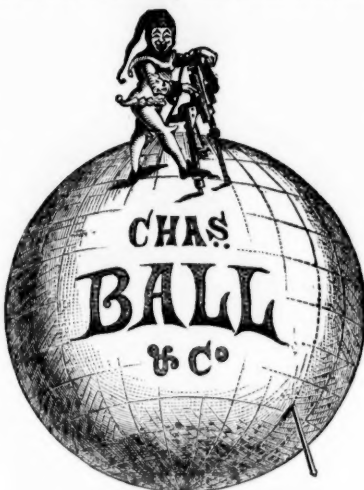
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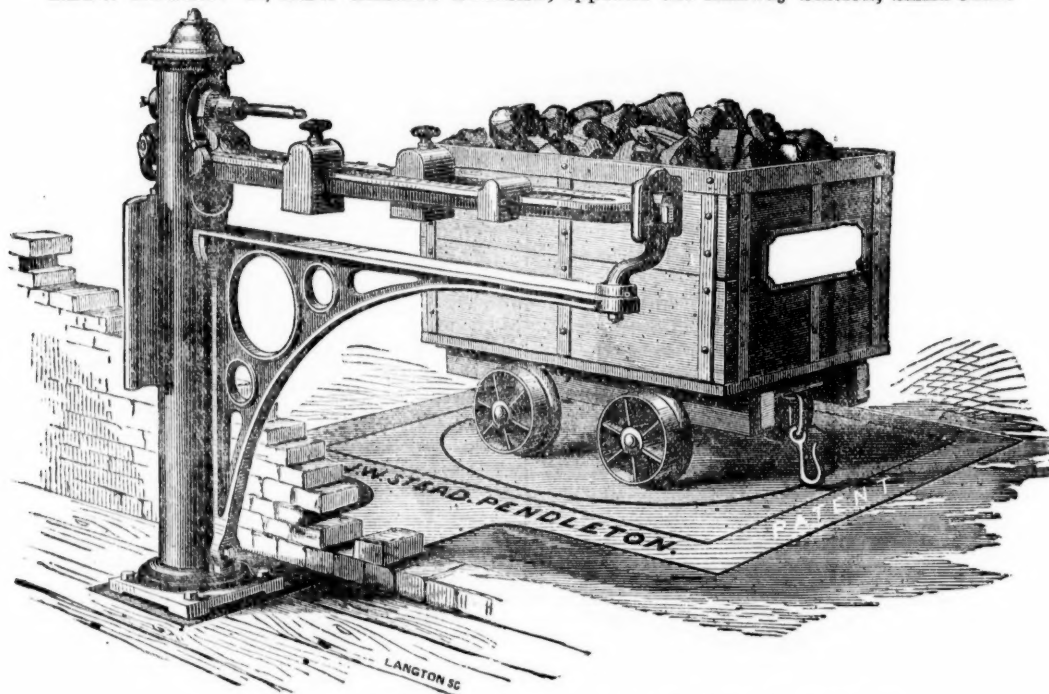
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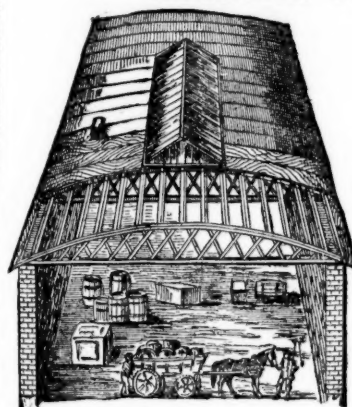
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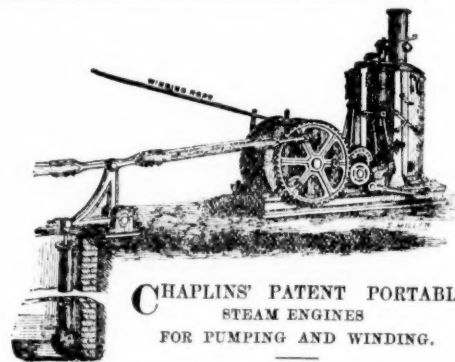
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Original Correspondence.

THE MINERAL WEALTH OF IRELAND—No. I.

Of the great mineral wealth of Ireland there cannot be the slightest doubt. It is equally true that no very startling results have as yet been shown from adventures in metalliferous mines generally. But paucity of capital, extravagance, ignorance, and frequent rascality, supply the explanation. The circumstances of minerals have, however, greatly changed within the last two or three years, and I am not surprised to see in your columns what appears to me an opportune idea as to the development of the industrial resources of Ireland. It is quite certain that Ireland will never develop her own resources. The ways and means must first be taken to her resources, and then she will not be slow to follow. The labour element is efficient, sufficient, anxious, and ready to work at a fair remuneration. This has been recently proved upon a pretty large scale in the coal measures of the Lough Allen district country—counties Leitrim and Roscommon, and at Coal Island, county Tyrone.

In the interest of Ireland it ought to be generally known that—
ANTRIM produces coal, lignite, clay, ironstone, brown hematite, specular iron ore, blackband, pisolitic and aluminous iron ore, rock salt, gypsum, &c.

ARMAGH, lead, copper, manganese, &c.

CARLOW, coal, &c.

CAYN, copper, lead, clay, ironstone, coal, &c.

CLARE, lead, manganese, copper, zinc, antimony, pyrites, &c.

CORK, coal, copper, lead, barytes, zinc, auriferous gossan, silver, pyrites, manganese, magnetic iron ore, &c.

DONEGAL, lead, specular iron, zinc, copper, silver, pyrites, &c.

DOWN, copper, lead, barytes, specular and magnetic iron, manganese, pyrites, &c.

DUBLIN, lead, zinc, native silver, manganese, copper, &c.

FERMANAGH, copper, magnetic iron, &c.

GALWAY, copper, silver, bismuth, lead, specular iron, pyrites, zinc, manganese, &c.

KERRY, lead, silver, copper, zinc, cobalt, pyrites, &c.

KILDARE, lead, zinc, copper, &c.

KILKENNY, clay, ironstone, coal, lead, silver, copper, micaceous iron, &c.

KING'S COUNTY, lead, copper, &c.

LEITRIM, bituminous coal, lead, copper, silver, micaceous iron, barytes, fire-clay, hematite iron, clay, ironstone, pyrites, &c.

LIMERICK, silver, lead, copper, pyrites, &c.

LONGFORD, argentiferous lead, hematite, &c.

LOUTH, copper, lead, antimony, &c.

MAYO, copper, lead, pyrites, silver, &c.

MEATH, lead, copper, &c.

MONAGHAN, lead, zinc, manganese, gypsum, barytes, antimony, &c.

QUEEN'S COUNTY, hematite, coal, &c.

ROSCOMMON, bituminous coal, clay, ironstone, gypsum, fire-clay, &c.

SLIGO, bituminous coal, clay, ironstone, silver, lead, copper, barytes, &c.

TIPPERARY, copper, lead, silver, pyrites, zinc, manganese, coal, &c.

TYRONE, anthracite coal, clay, ironstone, hematite, lead, antimony, copper, &c.

WATERFORD, copper, lead, zinc, cobalt, micaceous and magnetic iron, &c.

WEXFORD, lead, zinc, micaceous iron, pyrites, copper, &c.

WICKLOW, lead, magnetic iron, copper, gold, tin (?), pyrites, antimony, arsenic, silver, zinc, &c.

The above surely affords an ample field for legitimate enterprise. In Mr. Hunt's "Mineral Statistics for 1872" we find Irish mineral produce as follows:—

"Copper ores, 210 tons; lead ores, 962 tons; silver, 1040 ozs.; zinc ores, 634 tons; salt, 29,000 tons; iron ores, 176,550 tons, nearly all from county Antrim, except 29,999 tons blackband and hematite from county Wicklow; coal, 163,463 tons, of which was exported 511 tons. Of this quantity the Connought coal field has yielded 657 tons, and the Slieveagh district 47,125 tons. In 1873 the Connought coal field yielded probably 20,000 tons, and the Tyrone field 10,000 tons, and other districts a larger quantity, but as Ireland imports nearly 3,000,000 tons of coal annually it is not surprising that attention is at last drawn to Ireland's own coal resources.

The ULSTER Coal Field: In Antrim are three, and in Tyrone are five collieries, four only of which are working.

The CONNAUGHT Coal Field: In Roscommon are 24 coal pits, one half of which are working.

In LEITRIM are five pits, and as many millions of tons of coal, and only two are working. In SLIGO two pits are working.

The LIMERICK Coal Field: In the Castlecomer district, county Kilkenny, are 15 collieries, one-half of which are working. In CARLOW and QUEEN'S counties are four pits, ditto. In QUEEN'S county are 15 pits, ditto.

The MOUNTAIN Coal Field: In the Slieveagh district, county Tipperary, are 15 pits, ditto. In the Duhallow district, county Cork, are four pits, ditto. In the Limerick district are seven pits, and I believe, not one working. Surely this is a state of things that will not be allowed to remain very long."

In 1872 I drew attention to the coal and iron of the Roscommon district of the Connought coal measures by a paper at the meeting of the British Association; subsequently in a pamphlet containing favourable reports thereon of Prof. Hull, M.A., F.R.S., Director of the Geological Survey of Ireland, and Messrs. Greenwell, Marley, and Spencer, mining engineers of great practical experience, to which was appended for comparison analyses of the iron ores of Great Britain; and Mr. F. E. T. Hardman, of the Geological Survey of Ireland, read an excellent paper on the Tyrone coal field before the Royal Geological Society of Ireland. On Aug. 23, 1873, Prof. Hull wrote of "Antrim Iron Ores" in *Iron*, and on Sept. 20 Prof. Hull had another exhaustive article in *Iron* upon "The Leitrim Iron Ores."

Subsequently a notice of mine on "The Leitrim Coal" appeared in the *Mining Journal*. This year Mr. Meadows, C.E., of Dublin, has written a capital detailed report of the Castlecomer coal field. And in the "Dublin University Magazine" for January Mr. R. A. Watson, C.E., M.E., gives an able and interesting article on "The Mines of Antrim." He aptly introduces Shakespeare with "Question surveys; know our own estate," and he shows that in 1873 at least 200,000 tons of Antrim iron ores were exported, and that with proper railway communication a million tons will be the minimum quantity exported per annum. Ebbw Vale may, indeed, congratulate itself upon this. The non-sulphurous coal, in horizontal shallow seams, and the non-phosphorous ironstone, in conjunction with the finest possible limestone for fluxing of the Lough Allen district of the Connought coal measures, furnish materials in abundance for an Irish Middlesborough, possessing ready at hand unusual facilities of transit both by canal and railway, and plenty of willing hands to do the work.

The following extract from Sir Robert Kane's "Industrial Resources of Ireland" (1844) will interest some of your readers:—

"Some centuries ago Ireland presented a picture of manufacturing industry such as we would now find, perhaps, in the interior of Russia, or the mountainous districts of Northern Spain, but which the progress of the arts has banished from Britain and from Central Europe. Covered with forests, and possessing iron ore works in which the wood charcoal was employed, and thus iron manufactured of excellent quality—in fact, such as we now import from Sweden and Russia for all the finer purposes of cutlery and mechanism. Such kind of iron furnaces may be now considered as belonging but to the history of art; yet in a historical point of view it is not uninteresting to extract some particulars of this industry amongst ourselves from the remarkable work on the Natural History of Ireland, written by Dr. Boate two centuries ago. He writes:—'Of the iron mines there are three sorts, bogs, in others it is hewn out of rocks, and in others it is dugged out of mountains; of which 3 sorts the first is called bog-mine, the other rock-mine, and the third, with several names, white-mine, pin-mine, and shovel-mine. The first sort is found in low and boggy places, out of the which it is raised with very little charge, as lying not deep at all, commonly on the superficies of the bog and bog; nevertheless, in the melting it must be mingled with some of the furnace too hot, it melteth too suddenly, and stoppeth the mouth of the furnace, or, to use the workmen's own expression, choaketh the furnace. The second sort, that which is taken out of rocks, being hard and meer stony substance, of a dark and rusty colour, doth not lie scattered in several places, but is a piece of the very rock of which it is hewn, which rock, being covered over with earth, is within equally everywhere of the same substance; so as the whole rock, and every parcel thereof, is of iron. This mine, as well as the former, is raised divided and broken into pieces of what bigness one will: which by reason of the places; as that is necessary before they be put into the furnace. Of this kind hitherto there hath but two mines been discovered in Ireland—the one in Munster, near the town of Tallow, by the Earl of Cork's ironworks; the other

in Leinster, in King's county, in a place called Desert Land, belonging to one Sergeant Major Pigott, which rock is of so great compass that before this rebellion it furnished divers great ironworks, and could have furnished many more without any notable diminution, seeing that the deepest pits that have yet been made in it were not above two yards deep. The land under which this rock lieth is very good and fruitful, as much as any other land thereabouts.

The third sort of iron mine is dugged out of the mountain in several parts of the kingdom—in Ulster, in the county of Fermanagh, upon Lough Earn; in county Cavan in a place called Donbally, in a dry mountain; and in the county of Ulster, Tyrone, by the side of the rivulet Lishan, not far from Lough Neagh; at the foot of the Mount Slew-galen; in Leinster, in King's county, hard by Mount Mellick; and in Queen's county, two miles from Monrath; in Connaught, in Tomonund, in the county of Clare, six miles from Limerick; in the county Roscommon, by the side of Lough Allen; and in the county Leitrim, on the east side of the said Lough, where the mountains are so full of this metal that thereof it hath got in Irish the name of Slew Nerin (Slieve au-Jerin)—that is, mountains of iron; and in the province of Munster, also, in sundry places.

This sort of a whitish, or grey colour, like that of ashes; and one needs not take much pains for to find it out of the mountains which do contain it within themselves do commonly show it of their own accord, so as one may see the veins thereof at the very outside in the side of the mountains, being not very broad, but of great length, and commonly divers in one place, five or six ridges, the one above the other, with ridges of earth between them.

These veins or rivers are vulgarly called pins, from whence the mine hath the name of pin-mine; being also called white mine, because of its whitish colour; and shovel-mine, for the following reason: for this stuff, or ore, being neither loose or soft as earth or clay, neither firm and hard as stone, is of a middle substance between both, somewhat like unto slate, composed of shells, the which do lie upon another, and may be separated and taken asunder very easily, without any great force or trouble. This stuff is dugged out of the ground in lumps of the bigness of a man's head, bigger or less, according as the vein afford the opportunity. Within every one of these lumps, when the mine is very rich and of the best sort (for all the ore of this kind is not of equal goodness, some yielding more and better iron than other), hath a small kernel, which hath the name of honeycomb given to it, because it is full of little holes, in the same manner as that substance whereof it borroweth its appellation. The iron coming from this ore is not brittle as that of the rock mine, but tough, and in many places as good as Spanish iron."

Sir R. Kane adds:—

"It would be difficult in the present day, independent of chemical analysis, to furnish a better description than that given two centuries ago by Boate, as just quoted, of the bog iron, which is found in patches in almost every part of this island, and of the iron ore of the quality of Leach Allen, and that of the Leitrim district, was even then recognised. Before I leave Dr. Boate I shall extract his account of the financial condition of the iron trade in Ireland.

"To speak somewhat more particularly of the shares and profits of these ironworks, we shall instance the matter in one of the works of Sir Charles Coote, in the lordship of Mounthall, Queen's County. At that work the tun (sic) that is 20 cwt. of rock-mine at the furnace head came in all to stand in 5s. 6d. sterling, and the tun of white-mine, which he had brought him from a place two miles off, in 7s. These two were mixed in that proportion, that to one part of rock mine were taken two parts of white-mine; for if more of the rock-mine had been taken the iron would not have been so good, and too brittle; and being thus mixed, they yielded one-third part of iron, i.e. of 2 tons of white-mine, and 1 of rock mine, being mingled and melted together, they had 1 tun of good iron, such as is called merchants' iron, being not of the first but second melting, and hammered out into bars, and consequently fit for all kinds of use.

This iron we sent down the River Ouse, to Rosse and Waterford, in that kind of Irish boats which are called cots in that country, being made of one piece of timber. * * * At Waterford the iron was put aboard of ships going for London, where it was sold for 16l. otherwise for 17l. sterling, and sometimes for 17½l.; whereas it did not stand Sir C. Coote in more than betwixt 10l. and 11l. sterling, all charges reckoned, as well of digging, melting, fining, as of carrying, boat-hire and freight, even the cost of the other parts of the iron, such as the iron ore, being a part of the iron mine or ore come to stand in 5s. 5½s., and 6s. sterling at the furnace head; and it was an ordinary thing, as well where they used white mine as where they mixed rock-mine with it, to have a tun of good iron out of 3 tons of ore; in some places, where the mine was richer, they would have a tun of iron out of only 2½ tons of ore. Nevertheless, few of them gained more or as much as Sir C. Coote, because they had not the same convenience of transportation; and he himself did not gain so much by his ironworks in Connaught as by that near Mounthall, although the mines there afforded a rich ore, and that the tun thereof did cost him but 3s. at the furnace, because that Lough Allen, whereunto the same mines and works are contiguous, gave him the opportunity of carrying the ore by water from the mine into the works, and that in boats of 40 tons."

The Earl of Cork, whose ironworks being seated in Munster, afforded unto him very good opportunities of sending his iron out of the land by shipping, did in this particular surpass all other, so as he hath gained great treasures thereby, and knowing persons who have had a particular insight into his affairs, do assure me that he hath profited above 100,000l. clear gain by his said ironworks."

Sir R. Kane adds:—

"We thus see that 200 years ago iron was an article of export from Ireland to London."

I will now only observe that when the Arigna Ironworks were in swing, 40 years ago, the cost of transit from Lough Allen to Dublin was about 50s. a ton, and is now by lake steamer and railway about 7s.—*Dublin, Feb. 4.*

T. A. READWIN.

UTAH SILVER-LEAD MINING COMPANY.

SIR,—I should not again trouble you respecting the correspondence of "Large Shareholder," but for an error in the *Journal* of Dec. 13. As printed, my report states 15,000l. will be required if a new incline shaft is made; the amount, as per press copy of my report, is 15,000. As "Large Shareholder" refuses to give me the dates of my letters containing the promises and wonderful tales he complains of, he cannot be surprised at my not replying to his question; and, further, I do not feel at liberty to make public details and figures, although they would be most favourable to the enterprise.

He again refers to the Van Mine, stating that it has produced such extraordinary results from an expenditure of 60,000l., but omits to mention anything of its previous history, when for a number of years it was hanging between life and death, during a part of which time Captain Williams managed it gratuitously in order to help it along, and that it was only saved from entire collapse by his courage and perseverance, aided, of course, by talent and long experience.

Had "Large Shareholder" taken my advice, to call at the office and read the original reports, he would not now be labouring under the false idea of 15,000l.; and I hope henceforth he will take the only sure course to obtain correct information respecting the property he professes to be interested in.

JOHN LONGMAID.

Bingham Canyon, Utah Territory, Jan. 12.

MINING IN UTAH TERRITORY.

SIR,—Knowing you would like to hear about the mines in this interesting camp, I will give you the news and my own experience, which may be of benefit to your many readers.

The great mine of this locality is the Emma, which now bids fair to pan out all its original promoters expected. There is no question that it was originally over-stocked when it was put on the English market, but whether the English or Americans are to blame for this no one knows, but it is believed the English brokers got the heaviest share of the stock. Be that as it may, the Emma has been a long time in the background, but now the miners tell me, and they show the ore too, they have a 13-ft. ledge in the granite formation (you must understand no one else beside workmen are permitted to enter these English mines, so I have to depend on their information) which puts this—the oldest mine—at once at the head of the list, because the ore assays from 800 to 1200 ozs. to the ton!! I do not question this, for the samples taken from 10 tons at Mr. Mackintosh's sampler at Salt Lake City fully warrant the sly item of my mining friend.

We think it is erroneous policy—preventing strangers and newspaper men from entering mines solely owned in England; all others are open and free, and the superintendents take pleasure in showing any gentleman around, fully explaining their hopes and fears regarding the mines they are running really for public interest. It must be for some stock-jobbing arrangement, which your shareholders should see an end of as soon as possible, then you would find it is not all American swindling.

The Flagstaff has of late been changing superintendents and the entire system of its management. Mr. Patrick, the former United States Marshal of this Territory, is now in charge, and his business thus far has been paying up old debts. The general impression is that he will make a success, and a grand one too, of the mine and furnaces. He has come into the property at a very bad time of the year, and great allowance must be made for this; nevertheless, there can be no question about the ultimate result, for the Flagstaff has no superior.

The Davenport is now all tied up by attachments and trouble; they have had double-headed superintendents (as the Flagstaff had a short time since), and as a sequence have run themselves into all this folly. Their mine is said to be good, but just at the season of the year they should have been making hay the Sheriff comes down on them as the avalanche does sometimes on our roads and the poor traveller seeking for the precious metals in such altitudes and in such a country. The worst part of this mine is, it is said, the want of a perfect title. The Alice is now after them, as also the Victoria Tunnel Company. Some time since the Matilda was purchased by

that company, but this was considered a blind to the heavy claims now in hand. Its stock will go very low till all these conflicting interests are settled.

The Vallejo is still shipping ore, and may be considered as one of the valuable mines of the district. The Revolution and De Kay, really the same mine, is now the coming feature of the canyon, for they are getting out a large quantity of ore, and valuable at that. In fact, this camp is not yet prospected, and I could go on from one mine to another until you would say—Hold, enough.

But, to prove it is not all on this side of the mountain, the Read and Benson has struck an immense body of valuable ore just on the other side of the Big Hill, in Big Cottonwood canyon, showing beyond cavil the continuous existence of ore through these enormous hills. This little point of letting the newmen down into the English property will help me and others, and I will then give you the points as I see them with my own eyes.

C. F.

Alta City, Little Cottonwood Canyon, Jan. 12.

EMMA MINING COMPANY.

SIR,—Finding the rise and fall in the shares of this mine to be so frequent, I endeavoured to ascertain the cause, and not being able to gain any information at the company's office, and having occasion to send a cable to a mining engineer friend of mine in Salt Lake, I in it, on Saturday, desired him to go and inspect Emma Mine, and gain all the information, from every source possible, and report to me by wire if he discovered anything worth mentioning, and on Wednesday morning, the 4th inst., I received his reply, which is to the effect that the mine is in a very bad state indeed, and that the report of a fresh discovery of ore is quite untrue. This report of my friend is quite above suspicion, as he has no interest in the mine, neither have I, and I can guarantee his honesty and ability, and his report can be confirmed or otherwise at the office in Queen Victoria-street, where I have always found them willing to give all the information they possess. My friend also, some time back, told me that a few dollars will get a report of any description, however extravagant, into the American papers, which reports are pretty certain to appear, if they can manage it, in the English ones, and he warns me never to act on such unless they are substantiated from other sources; and I recommend my fellow-miners to adopt the same course, or when these interested news manufacturers have made the use they wish of these fictitious reports the legitimate investor, for whom I write and have previously written, will awake to find himself a considerable loser.

A LOOKER ON.

Gray's-court, York, Feb. 15.

THE EMMA MINE.

SIR,—During the last seven or eight weeks I have noticed a fortnightly rise in these shares, and a few days afterwards a fall, and it occurs to me that some of the knowing ones on the Stock Exchange and their friends are making money by alternately bulding and bearing our stock on the faith of a series of false statements and so-called authentic cablegrams, which latter were never sent, and have never been seen, save in the precincts of Chapel-court. When I see our shares quoted as high as 4l. I think, after all, Emma may to a certain extent redeem a portion of the reputation assigned to her by her disinterested Yankee vendors, and, instead of losing all my venture, may, by a succession of favourable authentic telegrams, lose but one-half, or at most two-thirds, of it; but on diligent enquiry at the office I find from week to week—no news; no telegrams—in short, nothing except that our Chairman is expected back shortly with an arrangement between the company and its American creditors—Mr. Park and the Illinois Tunnel Company—the existence of which claims so agreeably surprised me at the last general meeting. I suppose, from the very favourable news published in your paper, and supported by a corresponding rise in the shares, that the statement announcing a find of unlimited tons of ore, assaying 1000 ounces per ton, must be correct, and that I may safely assume these two above-mentioned claims have, by means of this wonderful discovery and Mr. Anderson's ability, by this time been settled, and that it will shortly be his pleasing duty, jointly with the committee, to announce a small dividend. I assure you I feel it a duty incumbent upon myself, as an original shareholder, and it must be equally so to all other shareholders, to accept gratefully this satisfactory conclusion of the labours imposed upon them at the last meeting.

But should, however, the next few days find our shares at the old price of 3l., I ask that every shareholder, original or otherwise, shall, as in duty bound, request the board to give us news accounting for it, or tell us plainly that they have not official news to justify this alternate rising and falling. Should the board not do this, I then think a protest might be made, and the committee asked a similar question. Failing these two sources of information, I think the shareholders should take some course to prevent the jobbers and brokers making the money they do by working upon our fears—the result of the ignorance consequent upon being governed by a body who, if they have no news of their own, will not be sufficiently energetic to confirm or contradict that uttered by interested persons, and our position as confiding shareholders is traded on and depreciated by want of energy on the part of our board of directors.

Ludgate Hill, Feb. 5.

JOSIAH CHILDS.

RICHMOND CONSOLIDATED MINING COMPANY.

SIR,—Since the violent attacks made upon me by Messrs. Postlethwaite, Applegarth, and Co., impugning my reason for pointing out to my fellow-shareholders the real position of our enterprise, I have not ventured to trouble you with any further communications. I now find, however, that nearly the whole, if not the whole, of my statements, then so angrily called into question by the exponents above referred to, have received confirmation by the facts adduced at the meeting last week.

Those of your readers who followed the discussion will do me the justice to remember that Mr. Applegarth pool-pooled—may, positively contradicted—my statement that "the mine was worked much too fast." I have now the opportunity of calling Mr. Probert and Mr. Clarence King as my witnesses. Mr. Probert says:—

"I venture to affirm that during the past year you have been working out your reserves too fast, and with less profit than would have been made with more deliberate action."

What does Mr. Clarence King say upon this most material point? Why he has actually suggested—at least, Mr. Probert tells us so—"that the works should be stopped altogether for six months, and would have done it had he taken the property in hand." What do Messrs. Postlethwaite, Applegarth, and Co. say to this unequivocal announcement, especially after the innuendos that I made a similar statement for an object of my own? The least those gentlemen can now do is to apologise. Again, what have those gentlemen to say to the following admission made by Mr. Probert:—

"The want of working capital has compelled your superintendents and agents to do their business in an unbusiness-like manner—your billion had to be pledged the moment it left the furnaces, and drawn against for the purpose of providing funds to pay miners' and smelters' wages, &c."

Mr. Applegarth will probably recollect the emphatic manner in which he contradicted my assertion as to the hindrances and additional outlay incurred in smelting during winter; but I have now the Chairman himself as my witness, when he says—

"I must tell you that we have never expected that the average rate of production would be maintained all the year through. You cannot work in the winter with the same advantage as you can during the summer months; and I may add, that it was a moot point for some time whether we should not discontinue smelting operations during the depth of winter."

We are, of course, indebted to Mr. Probert for much that he has done for the company and for the information he has laid before us; he is, after all, however, but a man of theories, than whom unintentionally none are more misleading, for in most cases they theorise and mislead themselves. Mr. Probert tells us frankly enough he is not a mining expert, but "that he has been down a good many mines," as though this were sufficient to entitle his opinion of a mine to respect. Mr. Probert says, "It has been raised as an objection that limestone formations are generally mere deposits and not true veins; nothing is more untrue." Why did Mr. Probert, after giving utterance to this very strong opinion, deem it necessary to dart away to Peru to find one proof of his assertion? Had Mr. Probert forgotten Mineral Hill, which is not only in the

"limestone formation," but, like Richmond, in Nevada? What does Mr. Probert think of South Aurora, also in limestone and in Nevada? Mr. Probert has visited Utah—how does his theory hold in that region? True, the Cerra de Pasco Mine is in limestone, so is Camp Floyd, Tecoma, Utah, &c.

But, perhaps, the most amusing attempt to "paint the lily and to gild refined gold" is the recent attempt made by Mr. Postlethwaite to include the residue of unextracted metal in the "halvans," or waste, in the "reserves." If Mr. Postlethwaite knew anything at all about the subject upon which he professes to be capable of expressing an opinion, he could not have made such an egregious blunder. It is not my business to inform Mr. Postlethwaite as to the cost of extracting the mineral from these waste heaps, but if he attended the recent meeting he must have heard the Chairman state that every time the ore was moved it cost \$1 per ton. Besides, if the mine does contain such inexhaustible bodies of wealth it would clearly be unwise to re-treat that from which certainly the larger proportion of mineral had already been extracted.

I propose to return to this subject in a subsequent communication, and in the meantime subscribe myself—
A SHAREHOLDER.
Feb. 4.

DEEP-SEATED MINERAL VEINS OR LODES.

SIR,—In the course of my remarks at the meeting of the Richmond Mining Company, last week, I had occasion to refer to the evidence of the eminent United States' geologist, Mr. Clarence King, at the recent trial at Eureka, as bearing on the formation of deep-seated mineral veins or lodes, and the means of distinguishing between them and mere deposits. It was impossible for me at the meeting to do justice to the gentleman's learned arguments; and as what I did say seems to have been too technical for the reporters, I venture to send you *in extenso* Mr. King's reasoning on the subject as taken down at the trial, feeling sure that it will be acceptable to most of your readers.—*London, Feb. 2.*
E. PROBERT.

By Mr. WHEAT: Mr. King, what is your profession?—A. Geologist.
Q. Where did you study?—A. At the Yale Scientific School, under Dana.
Q. What is your occupation at the present time, or what position do you occupy under the Government?—A. I am director of the Geological Survey of the 40th parallel.

Q. How long have you been engaged in that work?—A. Since April, 1867.

Q. Have you had occasion while engaged upon that survey to examine the mines of this coast?—A. Yes, sir.

Q. Are you acquainted with the Richmond workings on Ruby Hill?—A. I am.

Q. You understand that map that is posted there, I presume?—(referring to the map of the Richmond Mine of Eureka, 1872).—A. Yes, sir.

Q. Just describe in your own way how in your judgment that deposit of ore was formed there, the cavity formed in which it is deposited, how the ore was formed, and how it is classified by geologists, or how it would be classified?—A. The geological formation of Ruby Hill is quite a simple one, the main mass of the hill being formed of an underlying bed of quartzite, which is capped by transition strata of siliceous limestone, and followed upwards by heavy beds of crystalline metamorphic limestone. This hill, from its evident connection with the other mountains of the region, is the product of a mountain range. The strata which it is composed of are submarine in origin. They belong, as is shown by fossils discovered here in them by assistants of my own, to the Silurian and Devonian period, a very early period of the stratified rocks. These fossils also show it was an oceanic deposit. Other geological evidence gotten in here, and throughout the Great Basin, show that these strata were lifted from their submarine position at the close of the Triassic period, and folded into mountains and permanently lifted above the level of the sea; in fact, at that time they reached their present altitude above the level of the Pacific. Such an immense uplift as this, with the consequent pressure in the axes of the folds, produces two great effects—the metamorphism of the strata and the fissuring of the strata. Connected with such deep-seated fissuring as must necessarily take place in the folding of beds which our survey has proven to be 30,000 ft. thick, the fissures must necessarily penetrate to a great depth, and that they have penetrated to a great depth is proven by the deep-seated chemical action which has made itself evident through these fissures, resulting partly in mineral veins, partly in metallic mineral veins or lodes. In this special instance, the evidence of fissuring is present in the dislocation of strata, the presence of planes of fissuring, of cavities, and of striation of surface, indicating actual faulting. So far as that goes, we have then up to that point a submarine deposit lifted high into the air, metamorphosed and riven with fissures. Upon entering the Richmond Mine at this point, B, where the old line begins, we find ourselves immediately in ore, or within a few feet in ore, and following its workings downwards to this point, showing with a descent of about 140 ft., if I remember right, or 128 ft., perhaps, to be more exact, were all the way in ore. That ore is composed of three recognisable zones; that next the lower country rock or siliceous limestone, containing chiefly iron material impregnated with galena and carbonates of lead and silver; a central zone chiefly occupied by carbonates of silver and lead coloured with oxide of iron; and a third zone, which usually caps the deposit, which is poorer, chiefly oxide of iron, whose tenure of ore, however, is carried up by gold. The presence of a deposit of this character, I use the word deposit, not the technical sense in which it has been used here, but in the generic sense in which alone it is known to geologists, so far as I am aware—to include all these bodies of ore which are found in the solid rock, or otherwise all deposits of ore. The presence of such a—ore, I should go back a little further and state that at three points in the Richmond workings, having gone downwards through the ore perpendicular to its general inclination, we came upon a surface siliceous limestone, which, in my opinion is the definite footwall of the vein, and that in two or three places in the upward developments of the mine we came upon broken surfaces of limestone more or less shattered in their surface, more or less impregnated for a little way with bunches and stringers of ore, which I take to be the rough hanging-wall of the lode. The presence of a body of ore like this, enclosed in solid rock, and have owed its origin to only one, as I take it, of three possible causes; either it was laid down synchronously with the strata—that is, upon what is now the approximate footwall of the vein—and upper country limestone was laid down on the top of it; or else it was poured in by the Divine hand from the top; or else, like other fissures and true veins, it percolated from a deep source. I shall briefly examine these three possible theories to see what ground is left us to stand on. In the case of ore beds, as they are technically termed, we have deposits of various metallic minerals, which are absolutely a part of the stratification, following the plane of stratification resting upon the even surface of a submarine deposition, in no case penetrating into the footwall an inch or a foot, having a level surface of deposition on their own top, and followed in the course of deposition by the upper country rock in a smooth plane. Such deposits sometimes often occur in iron and coal and such minerals as that. The evidence as to the bedded origin of this vein is very clear. In the first place, the body of ore does not exactly follow the planes of stratification, but breaks into them here and there, and alongside that, within the solid body of ore, are masses of limestone, which are termed "horres," not going through like a continuous sheet as if they had been deposited upon a top portion of the ore during the general deposition of ore, but terminating at their ends and of irregular form, thereby conclusively proving that the body could not have been deposited in the ordinary method of oceanic deposition. To examine for a moment the other possible theory, that it was poured in from the top. Ample geological evidence exists that these mountains, as I have said, since the close of the Triassic period—a period anterior to even the chalk period of England—have been in their present positions of elevations; and, furthermore, that the only portions of the Great Basin that have been since that period covered by water have been covered by fresh water lakes. They simply occupied the broad meridional depression of valleys or synclinal axes of these ranges, resulting in proof to my mind absolutely conclusive that these mountains have never since that period been covered by water, and in order to suppose the mineral material to have been poured in from above, we should have to have some Angel Gabriel with a pitcher, or some other supernatural agency, to get this material in there; and the fact that it was never done is proven by the conditions within the ore body itself, for whenever you pour a material into a cavity it shows the results of stratification inevitably, which this does not; showing a bedding parallel in a measure to the inclination of its dip. Furthermore, in order to have the cavity to have poured this material into from above it is necessary that we should have had a fissure to begin with, for the water percolating or flowing over solid limestone has not the power to eat or erode its way into it. It must first find some crevice, some fissure, and some hole formed by dynamic agencies, into which it can percolate, and then, as the cavern, or aperture, or hollow, or whatever you wish to call it. Therefore, I say that it could not have been poured in from above, and that even if the evidence of stratification were present of its having been poured in from above, it would need scarcely have implied a fissure to begin with. I, therefore, reject these two propositions as absurd: the proposition of a bedded vein, or of a deposit poured in from above. I am, therefore, driven back on the first theory—that it is a vein or lode; and I will as briefly as possible examine the evidence which exists bearing upon this question—in the first place, within the Richmond works: I will indicate the points which I mean exactly. At this point here (showing), just within the little arched mass of rock which overhangs the opening of that tunnel which runs to the Richmond incline, and underlying the body of ore is a smooth well-defined face of rock, possessing upon its surface marks of attrition or striation, the polish of movement, and differing altogether from the ordinary rough planes of stratification. Upon descending the main incline of the Richmond Mine, and following this lowest level to this point, the limestone up to this time showing various evidences of its auriferous and somewhat siliceous in its nature, shows at that point the same footwall equally smooth, equally evincing the lines of movement. At a third place, which is at this point, N, the bottom of that is also a moderately smooth surface of siliceous limestone, which from its pitch and its relation of depth to this (showing), and its relation of strike and depth to that (showing), I take to be the same plane which bounds the ore in that direction. At a point FF—no, not FF, at a point LS, if I know the map rightly—is also an upper surface of limestone, which I take to be the lowest manifestation of the hanging country or hanging wall, irregular though it be. Down this incline (showing), over the lead, appears also limestone, slightly impregnated with blocks of ore, but, nevertheless, a country limestone, and the developments which have been run into the Tiptop, out in this direction (showing), through first the Richmond, into the Tiptop, and out in that direction, prove that that is the country rock, and that there are no masses of ore of any consequence above that point. Beneath what I called the footwall, the shaft has gone down on an incline of 250 or 300 ft. underneath the footwall altogether in country limestone, and run out on a drift through country limestone, proving that at that point there are no important or considerable stringers or outcrops of ore in that direction. The evidence, as I have said, of fissuring is in the surface of these walls, which do not absolutely follow the planes of stratification, and possess physical differences from those planes of stratification in the cross of fissures which make themselves apparent at the end of the workings in this direction (showing), and at the end of this ore chamber—at the edge of this ore chamber here (showing), where the limestone of the country rock, with also lines of fracture and fissuring, bound the deposits at those points. I see every structural evidence that the origin of this opening, or hollow in the rock, was by a fissure. I believe that the ascending currents

of mineralised hot water from which this thing emanated, in passing upwards through these fissures, owing to the solubility—the ready solubility of the limestone has here and there often very greatly enlarged the original fissure, opening the great cavern which has been subsequently filled by ore. The whole history of the study of mineral deposits approaching this at all in character show that they have proceeded from a deep-seated laboratory. The minerals of which they are composed, the mineral combinations, the chemical combinations in which they are formed, cannot have been made except by the successive introduction of mineralising liquids and gases. The presence of gold, the presence of arsenic, the presence of sulphuric acid, which has mineralised the galena, taken together, indicate the regular succession of chemical changes which have gone on according to the best authorities in chemistry in all veins. The peculiarities, I contend, of this particular deposit are wholly to be accounted for by the special condition of the country rock. Veins in general—that is, I mean true veins—may be said to be the result of the forces from fissuring from a deep source; and, second, of the emanation of chemical materials from that deep and heated source. They differ from each other widely as to appearance, widely as to chemical history, and widely as to shape and form. These veins which are in the old granite, and in a large family of gneiss and crystalline, schist rock, present the phenomena of an ordinary tabular vein. These veins, on the contrary, owing their origin to similar forces, but created in different country rock—those that are found in volcanic rocks, the porphyries of Mexico, the porphyries of Hungary, and the porphyries of Washoe—are immense irregular veins, owing to peculiarities of the texture of the rock, and the tendency to conchoidal fractures, forming elliptical chambers which those volcanic rocks possess. There is a third class of veins, those where the identical forces have acted on soft sugary rocks, rocks which from their mineralogical and lithological structure, have a tendency when met by a given force to shatter in every direction. That class of stones are the limestones and the dolomites of this world, and the same forces have acted on these dolomites and limestones in their metamorphic conditions. The results have been immense irregular fractures of very great diversity of form, and a consequent irregularity and difficulty of following the ore deposit itself. I contend that the sole difference between the three classes of veins is that of the country rock upon which the fissuring force has acted, and through which the deep-seated chemistry has done its work. I also lay down this proposition—that given the deep-seated fissure, and given the deep-seated chemical action, the form has nothing to do with its nature as a vein, and that the amplitude or irregularity of chambers in no way militates against the theory of its being a vein. I pronounce this to be a vein.

RICHMOND CONSOLIDATED MINING COMPANY.

SIR,—The information given by the Rev. E. Probert in his able address to the shareholders at the meeting last week was not only most important to them, but is extremely interesting from the light it throws on the causes of failure in many American properties, owing to the rule and careless way of dealing with the ore. The great natural advantages of the Richmond Mine have carried it over immense difficulties to a grand success; but it is clear that the success might have been still greater had the precautions now taken been adopted earlier. As Mr. Probert estimated that the reserves won in the last three months before the Lizette tunnel had a profit value in them of 240,000, in addition to those reserves above that level, estimated by Messrs. King and Price at 80,000 tons, from which only 30,000 had been used, it does not seem improbable that we may, ere long, begin to reckon our profits on Mr. Probert's cheering scale—"after getting back the whole purchase money."

It must be satisfactory to those connected with mines in the limestone formation to know that the popular idea of their only containing mere deposits is an entire fallacy, some of the richest and most lasting lodes being, as Mr. Probert proved, in limestone strata. The question was raised at the meeting as to the desirability of providing a larger turn-over capital than the company at present possesses. As the present year's gross product from the mine, judging by former data, will probably amount to 500,000 sterling, it is obvious that such an immense product will require a proportionate large floating capital to obtain the best result. There can be no doubt that it would pay largely to add some 20,000 more to the turn-over capital, either by a temporary loan or by reserving that sum out of the future profits, 30,000 having been already set aside out of the last year's earnings for that purpose.

It appears, however, to have been overlooked by those who discussed the point that, but for the drain on the last year's profits caused by the lawsuit and extra cost of new acquisitions over the permanent capital provided, there would have been by this time either a larger amount to be divided, or a sufficient balance left over that distributed to have brought the turn-over capital up to the required point—500,000. It is evident, therefore, that without diminishing the past rates of dividend the mine has ample proved resources to pay that and leave a balance more than sufficient to supply the estimated requirement of ready cash. Mr. Probert expressed his belief that the ore in future would yield 5s. per ton profit. All the great results of the past year were obtained on a profit of 3s. 12s. per ton. Here, then, as it strikes me, is a point on which all might agree—to leave this anticipated extra profit of 1s. 8s. per ton to be used, first to raise the turn-over capital up to 500,000, and then applied, as it further accrues, in reduction of the original capital.

The Chairman explained that they were in a better position than ever before to make large profits with existing resources, but that those profits could be greatly increased by extra capital. Mr. Corrigan added that the resources of the mine were quite sufficient to pay for all the contemplated improvements without any sensible diminution of dividends. I name this because an impression prevails that the company is in need of money, the only necessity in the case being that of making still larger profits. Mr. Probert's significant commentary on the proposition to accumulate more capital being that the profits hitherto have been only one-third of the gross returns, but they hoped in future to clear one-half.

Douglas House, Tellington Park. CHAS. WM. COOK, A Shareholder.

TECOMA MINING COMPANY.

SIR,—At the Tecoma meeting, on Monday, Sir A. Malet read out a telegram addressed by Capt. Forbes to me in July last, beginning "all d—d nonsense," &c. As the chairman did not inform the meeting what it was in reply to shareholders may be misled, and as I was unable to gain a hearing, until too late, perhaps you will allow me to state the following.

At the time in question I was informed that the following reports were everywhere current (some of them appeared afterwards in the papers)—that the Flagstaff had not an ounce of ore in it, and never had; that not a ton of ore had been hauled since Capt. Forbes had been in Utah; that 10,000 tons ore had been bought outside by the three companies, and that this was what they were selling and smelting; lastly, the name of a well-known gentleman was given who was said to have sent information to London more or less confirming the above.

I telegraphed these extraordinary statements to Capt. Forbes, and hence the reply with which the meeting was favoured.
Charing Cross, Feb. 4. L. FORBES.

MINING ON LAKE SUPERIOR.

SIR,—The panic seems to be easing up a little, and better times are soon expected, particularly as copper has improved in price. Another strike took place at the Calumet and Hecla Mines on the 1st inst., not in favour of higher wages but to remove two of the mining captains, who are accused of being exceedingly unpleasant with the men, and guilty of making unfair measurements in the miners' contracts. Although it may be true, yet of course the company did not give way to the request; if so, perhaps the treasurer would be the next one to be removed. This shows, however, there cannot be a general good feeling between the captains and men, nor is it likely to be for some time. To this end you will doubtless agree with me that the work cannot prosper with that degree as it otherwise would. The company, I believe, felt determined rather than give in to the miners to stop the mine until new hands could be had, but the men gave in and resumed work again in a few days. If the mine had stopped for awhile, it is reported that the company has \$2,000,000 in the treasury to keep up their usual dividends. The prospects of the mine for copper never looked better than at this moment. True, the product has fallen about 50 tons per month for the last couple of months, but this is entirely owing to the irregularity of the men in their work from a reduction in wages.

The old cliff is looking remarkably well and is paying a handsome profit upon the outlay or working expenses; upon 15 tons tons per month they are clearing \$3000. The Alouez is making large preparations, opening ground rapidly preparatory for two heads of Ball's stamps, which are in course of erection and to be completed next June. The stamps is 2½ miles from the mine. A locomotive engine with the necessary cars is purchased to convey the rock to the stamps. Under the first organisation the company called in \$15 per share upon \$20,000 shares. Last fall they re-orga-

nised and called in \$6 per share upon same number of shares, making in all \$420,000. That the mine will warrant such an outlay is not believed by many, and great fears are entertained that it must go to the ground.

The agent who attended a meeting of the stockholders in Boston said, "He saw nothing to alter his good opinion of the concern. Very anxious to push ahead." Had he been a practical miner it is a query whether he would have talked so strong. Lake Superior has launched out heavily in foolish mining, and from many years experience in such matters, I consider it is high time to come down to economy and sound judgment.
ONE INTERESTED.

Lake Superior, Jan. 12.

MINING ON LAKE SUPERIOR.

SIR,—I presume that it would not surprise you, nor many of your numerous readers, if I stated that the copper interests of Lake Superior were at this time in a very depressed condition. On the whole, however, I cannot say so. The mining business of the United States was sadly crushed by the panic; iron, however, felt it heaviest; copper, probably, least of all. In common with everything else, that metal receded in price, but soon recovered, and is now quoted at 24 and 25 cents, per lb., which figures are, perhaps, better for 5s. than higher prices.

Several mines reduced their forces at the close of navigation, and one or two unimportant ones ceased work altogether; but I believe there are at this time more miners employed in the counties of Keweenaw and Houghton than there were a year ago. The prospects of the mines, on the whole, were never better.

Wages are lower; one reason is the superabundance of men. Marquette Company discharged more than half the force employed in its numerous and extensive iron mines, and many of those people found their way into the copper districts, which were already replete with the augmentation received during the summer.

Large numbers of Cornishmen, and still larger numbers of Scandinavians, found their way here during the summer. Many Cornishmen found the state of the labour market different from what they were led to expect, the high prices of last winter began to give way as the mines began to fill up with men. Many have gone back to the "Old Country," believing that they are disgusted with this. These will come back again as soon as the iron industry assumes its normal condition, for this reason—the poverty of the Cornish tin mines generally (the copper mines are scarce worth notice) and the price of the metal compel lower rates of wages, at least the Cornish mine managers believe so, and seeing their opportunity on the return of the miners seize it at once. The resumption of the five-weeks month or a reduction of wages follow.

In the spring there will be a demand for miners, and at least fair wages can be obtained. Men that have once been here cannot be satisfied with the wages Cornwall will pay. Cheap and rapid transportation across the Atlantic affords the most natural and the easiest mode of escape, and the flow of travel will again be westward.

There was a strike inaugurated at the Calumet and Hecla Mines at the commencement of the year. The better informed and more reasonable portion of the men took no part in it. The others scarcely knew what they wanted, and as the management stated positively that there was no intention to accede to any demands made on them, after two or three days spent in idleness all hands returned to work.

The weather this winter has been remarkably fine, no heavy snow storm so far, nor any intense cold. In the woods there is not over 18 in. of snow.—*Keweenaw Co., Mich., U.S.A., Jan. 8.* J. D.

COAL A DANGEROUS CARGO—No. V.

SIR,—The second method of preventing spontaneous combustion which I propose to examine is ventilation. Taking the word in its general meaning, I think I may classify the schemes coming under this denomination under the following three heads:—

- 1.—Ventilation through the hatchways.
- 2.—Ventilation through the hatchways, with the cargo divided by cuttings.
- 3.—Ventilation by blasts of air.

Ventilation being once thought of as a means calculated to prevent the production of heat in a cargo of coal, it was at first assumed that the hatchways of the vessel would afford a sufficient supply of fresh air for the purpose. But those who first started this notion lost sight of the fact altogether that ventilation cannot take place *per desensum* when air has to be replaced by air; and, therefore, when the hatchways are the only means of ventilating it is obvious that there is no ventilation at all, although the hatchways may be sufficient, when opened, to prevent explosions of gases. Besides, the hatchways cannot always be open; they must be battened down, for fear of greater danger when the sea is washing over deck. Having once become alive to the insufficiency of such ventilation, naval engineers sought to devise some better and more elaborate means of circulating air through the hold. The system that was then proposed is based on the following considerations. When it was found that great heaps of small coal that used to accumulate at the pit's mouth were liable to become heated, it was rightly thought that the heat originated in the centre, and that a longitudinal cutting through the middle of the coal might be sufficient to stop the progress of the calorific and keep the coal cool. It was soon found that this plan fully answered the purpose; only, when the heap was large, it appeared necessary to make other longitudinal and cross-cuttings, besides the central one. The current of fresh air thus admitted would readily bring down the heat along the sides of the cutting.

The same place was subsequently adopted to cargoes of coal on board ships, and the cargo was considered like a heap, and divided longitudinally into two parts by a cutting of about 6 in. in width. But there is an obvious difference between a heap of coal on shore exposed to the actions of the atmosphere and a cargo in the hold of a ship. In the latter instance, supposing the cutting always kept clear, there is still reason to believe that it will not have the same effect as a cutting or cuttings through heaps of coal in the open air. First of all, in these the air in contact with their surface is colder and is constantly in motion, whilst the air in the hold of a ship is warmer, and mostly stagnant. If it finds its way to the heated part it would not tend to reduce its heat as the cold atmosphere on land does. In the second place, the cutting through the heap on board ship is at best a very narrow slit, and the air of the hold has not that free access to the coal along the sides of the ship which it has along the sloping sides of the wide grooves made in heaps of coal accumulated on *terra firma*.

But there is a third and more important difference still between the two cases. When the great heap of the cargo is divided in two, the action of the heat will obviously not operate at any spot near the cutting where the air might reach it, but in the very heart of each of the heaps, that is to say, in the place most distant from the surface, perhaps about the bilges, and no air brought into contact with the only open surface of each of the heaps in the ship could reach this central seat of the heat. This drawback is not confined to horizontal incisions; it applies with equal force to Mr. Robert Hunt's system of ventilation, which consists in providing two shafts, one going down to the bottom of the hold, the other down to the inner surface of the deck; that last shaft joining the caboose chimney, where a fire would be lighted. By such a system it is quite possible, but by no means probable, that a diminutive current of air may be obtained, but at all events the draught thus produced must necessarily be very limited.

Hitherto I have assumed that the cargo to be ventilated was shipped dry, and kept dry all the time, for if this were not the case the ventilation of a dry cargo in wet weather would have for its effect to moisten it, and the ventilation of a wet cargo during wet weather would be quite nugatory, and if the weather was dry the effect would be very limited. The whole reasoning also rests on the supposition that the system of ventilating is kept in constant operation from the moment the coal is put into the hold until it is taken out, for if it were otherwise the draught of air, supposing there is any produced, would have quite the reverse effect of the one intended, for it is very plain that if either of the two schemes of ventilation were brought into play some time after the lading, and worked "by fits and starts," it would, instead of lowering the tem-

perature of the cargo, serve as a means of blasting the already heated coal. Again, unless the cargo is divided into small heaps by a series of cuttings of some width, the attempts at ventilating must needs prove utterly abortive, and everyone knows that such an extensive grooving of cargoes of coal is practically out of the question.

Having now disposed of this second mechanical method of counteracting spontaneous combustion, I purpose in my next letter to revert to the original causes of accidents arising from explosions previous to entering upon the examination of the various chemical reagents, and their merits and demerits.

A. VASSARD.
7, Carlton-square, New Cross, Feb. 4.

COMPRESSED PEAT AS A CHEAP FUEL.

SIR.—It is a source of the utmost gratification to me to be enabled to inform you and your readers that the letter which appeared in the Journal under this heading, last week, has been the means of calling the attention of several gentlemen possessed of ample capital and influence to carry out this very desirable object. In no county, I am certain, is there peat to be had of a better quality than in Cardiganshire, and one gentleman remarks, "I have seen bog fuel in Wales nearly as solid as coal." I have no doubt whatever the owners of these peat bogs will act most liberally with any parties who will be willing to carry out this great scheme, whereby hundreds of thousands of tons of peat might be annually compressed for centuries, and would confer an everlasting boon to the inhabitants of this county, Montgomeryshire, Merionethshire, &c., in none of which has 1 lb. of coal ever yet been raised.

The benefit to be derived by all classes from such an undertaking is quite incalculable, and on this account alone I believe the landowners, who I know have the good of the community at heart, will act liberally, and which I hope soon to be in a position to apprise you is an accomplished fact.

Goginan, Aberystwyth, Feb. 3.

IMPROVED MINING MACHINERY.

SIR.—In the very interesting letter of "One who wishes to see Mining Prosper" in last week's Journal, a very important question is raised as to what has become of the patent pulveriser which was to return from 4 to 6 tons of rich silver ores per month from stuff at Bronlloyd that Capt. Kemp, the late agent, has been throwing into the river? and it is stated in reply that so far from adding 4 tons of marketable silver ore per month to the returns it never returned as many pounds, and took all the power of a 25-ft. diameter water-wheel to turn it. Now, there are a large number of the readers of the Journal in Cornwall who are anxious to see this matter well ventilated, as the machine has received what many consider to be very unjustifiable eulogy, whereby really useful machines have been prejudiced. It has been very freely rumoured in Cornwall that although through the apathy of a committee leaving the duty of making an award in the hands of a single individual the pulveriser obtained a most important prize, it was condemned as opposed to all correct mechanical principles and utterly unlikely to become a practical success even before the premium was paid; and where there is even the appearance of jobbery in so important a matter as the award of prizes it not only reflects discredit upon the persons immediately concerned but also upon the society which sanctions the award, and lowers the standard of such prizes altogether. Perhaps Mr. J. H. Collins would kindly state for the information of your readers at what mines Dingey's pulveriser is now in operation, how long each machine has been working, and the cost of repairs and renewals during the time; what power has in each case been employed to drive the machine, and what has been the extra return of tin in each case. It is essential that this information should be published in order to admit of an opinion being formed whether in the case of Bronlloyd it is the agent or the machine at fault.—Falmouth, Feb. 5.

F. C. W.

DUTY OF AGENTS TO WORKING MINERS.

SIR.—In the letter of your correspondent, "Readers of the Mining Journal," which appeared in the Supplement to the Journal of November 15, the writer seems to take a wrong view of my remarks, that mining captains have nothing to do but talk to men seeking work. And that one price should always be paid, whether soft or hard ground. In the first place, my motive was to show there was a want of civility on the part of agents to workmen. I have witnessed when men have entered the account-house, seeking employment, they have not only not even got an answer, but been ordered out, or they would be kicked out. This is characteristic of some agents to men in my day in Cornwall, and I have understood it to have been kept up whenever it could be. If necessary I can enumerate several acts of the above kind, and name the agents, mines, and workmen in question.

The old proverb is "A kind word turneth away wrath." In this case of men seeking employment would it not have been quite as easy, and by far more manly, on the part of the agents in reply to say, if no work, "Men, we are sorry to say we cannot do anything for you?" Is it not the duty of agents to practice civility? In fact, it is the duty of all—everyone.

In the next place, as regards the price paid the miner, I tried to be understood that it was in accordance with what had been earned; for instance, if it were survey-day, and the men had not come up to the mark by a few shillings, the price would be raised. If the contrary the price would be cut down, having no reference as to the real value that should be given that day, requiring no judgment of the kind whatever. At the same time, I contend that the miner was reasonably paid for the work done.

Except once in awhile, when metals go up, and a little excitement is felt, Cornish miners work for 2*l.*, 2*l.* 10*s.*, 2*l.* 15*s.*, and occasionally 3*l.* is launched out. Perhaps the average may be 2*l.* 5*s.*, or a little over, while at the prices paid they could, by good labour, earn 3*l.* 10*s.*, 4*l.*, and in some cases 4*l.* 10*s.* or 5*l.*; but should they put in one month, or even one stent, at that rate it would be the last. The price would be cut down in proportion to what they had earned. Hence the Cornish mode of working—four men working for six. Where the night-shift men ought to be are darkness and silence, in order to keep up prices.

I say to mining captains meet your men civilly. Give them long contracts when you can, with the understanding that each and every contract shall support itself. That you will give them every opportunity in your power to work out their contracts with all speed. You would thereby induce them to work honestly, and for their faithful labour they would, to the satisfaction of their employers, earn good wages, at greatly reduced prices, and throw aside all thoughts of leaving their native land—not only so, but bring home many who are now away.

I do not wish to be understood to uphold the miners in high wages, but my principle is to have men work faithfully, and to earn fair wages, which can be easily accomplished, to the great benefit of both the mining companies and the miners.

I am sorry to say that I have noticed the Cornish mode of contracting practised here on the Lakes in two or three mines—that is, that no man shall get over a given figure in a month. No question about the amount of labour done. There were four men drifting in one of those mines; they had taken a contract for the month; previously they had been going on in their sluggish way, working about two-thirds of their time, and earning to the cent almost what was allowed. This, of course, pleased the captain, but the men, having an idea they could earn 10*s.* each a month more in another mine, by working faithfully, they made up their minds to make the change; but before doing so they thought that by hard work a good month's wages might as well be picked up in their old drift. They accordingly worked out the month; and, instead of earning about 45*s.*, as was allowed, they secured the handsome sum of 72*s.* each, and left. The captain being a Cornishman, and having considerable of John Bull in him, his feelings and actions can be better imagined than described.

I wrote you the other day on opening mines from surface, down-right shafts sunk in the country rock, compared with sinking in the lode, and I hope some of your able correspondents will give some attention to it, and advise us, from their own practical knowledge,

through the columns of your valuable Journal. Downright shafts and cross-cuts must be equally as expensive as similar openings in lodes. For instance, look at South Roman Gravel, having a cross-cut in 128 fms., or 768 ft. It seems to me that the question may be asked, could not that money as well have been spent in the Roman lode, and thereby knowing long ago the value? A MINER.

Outonagon, Lake Superior.

MINERS' CONVERSATIONS—No. XIII.

Bill.—You know our neighbour, Mr. Lanyon, very well?

John.—Of course I do; and I knew his father before him. His father, the late Mr. J. C. Lanyon, came here from Helston about 50 years ago, when a young man, and opened a shop in Fore-street, the same side as his present shop, only about ten or a dozen doors further up the street. He commenced with a very small capital, for his father, the honest Mr. John Lanyon, of Helston, could not afford to give him much. He made his way in the world partly by merchandise, and partly by judicious speculations, so as to leave a large fortune for his son, Mr. Alfred Lanyon. He (Mr. A.) is more clever than his father for making money. He is amassing wealth with great rapidity by the purchase and sale of mine materials, &c. He paid 12,750*l.* for Clifford materials, by which he must have realised some thousands, having disposed of them at good prices. I have heard that he is making money now by returning tin from the halvans and from points in the mine above the adit level. Having a large capital he can purchase any amount of mining materials, &c., and as "money makes money" he gains rapidly. The materials at Balleswidden Mine were purchased by him, also the "leavings" on the mine. I heard lately that he had sold 40 tons of tin already, and that he expected another 40 tons to be sold thence! Now, 80 tons of black tin, at 80*l.* per ton, amounts to 4800*l.* Mr. Lanyon did a good act a short time since by a donation of 500*l.* for the reduction of the Redruth Wesleyan Chapel debt. The Wesleyans are wisely making efforts all over the country to extinguish their chapel debts. By-and-bye all will be clear of encumbrances, then the rents of pews may be applied to the maintenance of their ministers.

Bill.—Did you know the late Capt. William Davey, the father of the late Mr. Stephen Davey?

John.—Yes, very well. He was said to be a good miner in his day. He died 46 or 47 years ago, being at the time manager of the Consolidated Mines, in Gwennap. He was succeeded in that management by Capt. W. Francis, of Whitehall, who died in 1831; and Capt. Francis, was succeeded by his son William, also of Whitehall. He died about 20 years ago. Captain Wm. Davey began the "battle of life" as a stamps boy at half-a-crown per month. I suppose Ennor will say that that was a right beginning for a mine agent. Captain Davey had the management from time to time of several good mines. He was a successful miner, and so were his sons, Stephen and Richard, in some mines—East Wheal Rose, Wheal Buller, &c. I have been told that they netted 30,000*l.* by East Wheal Rose, and 100,000*l.* by Wheal Buller. But the Daveys had also some very poor mines, which, of course, reduced their capital to some extent.

Bill.—What a remarkable difference there is in the monthly pay of agents in Cornwall. Capt. W. Davey had 300*l.* or 400*l.* a-year at Consols, and his successors just the same, whereas some agents of equal ability have only about 120*l.* Mr. Williams, late of Scorrier, used to pay his agents 8*l.* 4*s.* per month, with an extra 12*s.* for expenses. One of his agents, who loved the bottle too well, after a pay-day, went to a public-house to drink, where he apparently forgot his duty, for he did not return to it till the following Wednesday. Mr. Williams, hearing of his delinquency, sent for him to come to Scorrier to give an account of himself. "Is it true, Capt. —, that you have been absent from your place ever since Saturday?" "It is, Sir; I thought that as you kindly give us 12*s.* per month to spend you would give us also time to spend it." Mr. Williams smiled at this singular answer, and forgave him. Whether the 12*s.* was cut off afterwards I don't know. This circumstance calls to my remembrance an anecdote I read in a book. It occurred at a school one morning, when the master was reading prayers with the boys. Having heard a hearty laugh during the prayers, after they were ended he asked who occasioned it. The boy was pointed out, and brought up, when he told his master that he saw a rat coming down the bell-rope, which made him laugh. The master told that if he would say something "worth while" he would forgive him. The boy, after a minutes' thought, produced the following lines:—

"There was a rat, for want of stairs,
Came down a rope to prayers."

This satisfied the master, who himself was also obliged to laugh.

John.—You know that 50 or 60 years ago mine surveyors were scarce, and seldom employed. The agents did nearly all the work in that department, and in some cases very badly, from incapacity. I knew a case where they were required to give the position of a shaft to be sunk from surface to meet one perpendicularly under about 60 or 70 fathoms. About ten or twelve agents made the survey, and each one placed a pin in the centre, as he called it, of the shaft. All the other agents did the same, so that there was a "forest of pins." Some of the agents went over the ground two or three times. When Mr. Williams looked at the pins he directed that the centre of the shaft should be in the middle of the thickest pins! Now, a competent surveyor would have found the point within an inch, so I heard a mine surveyor say a few months ago. In the case referred to the shaft was about 4 feet out of place in the place of meeting; but I have heard of errors much greater than that—fathoms out. I believe that Captain Towan was the first mine surveyor employed by Mr. Williams, and his knowledge of the science was very small indeed, having been brought up, I believe, a miner. The best agent surveyor ever in Gwennap was the one who kept up the plans at the United Mines. He knew how to do the work scientifically; I think that his name was Gray; he is now dead. The late Captain J. Kitto was tolerably clever in that line; or, I would rather say, careful and correct in what he did. At the present time professional surveyors, very properly, are employed to prepare and keep up plans of mines, having, after the plans are made, a small monthly salary for keeping up the same.

Bill.—Some of the mine agents of Cornwall have been very unfortunate as to finding good mines, and yet they have the reputation of being good agents—at least, in some quarters. There is Capt. T. Richards, Capt. John Nancarrow, &c., amongst the many unfortunates. All Capt. Richards's mines are idle, and some of Capt. Nancarrow's mines also.—St. Just, Feb. 2.

AGENT.

CORNISH MINING—MANAGEMENT.

SIR.—When the author of the articles called "Miners' Conversations" began his contributions to the Journal I had hoped that we should have received some assistance from him in exposing the evils existing in Cornish mining, but it now becomes evident that his motive tends more to favour than faithfulnes; and, like too many others who occupy the space allotted to Original Correspondence in your columns, he seems to have some ulterior object in view, and what from the attitude he has assumed should have been truthful statements of facts is sometimes turned into the puffery of a few partisans.

In a letter to the Journal last week on the above subject I endeavoured to point out what I consider to be the principal cause of the non-success of our mines, and if further proof of this were required, I might give the opinion of a few working miners on the question. No. 1 said to me unsolicited,—

"Captain, do you know how—knocked?" naming a well-known extensive tin and copper mine. I replied, "I have no idea how it was." "Well," he said, "I can tell you; the men didn't work. If the men worked she would have knocked, for she is a good mine." Knowing a second man who was an industrious fellow who had worked there I went to him and asked if what had been told me was true; and his reply was, that he believed it was true enough, and that he did not work there long himself, as he was always thinking they would never get a pay for the small amount of work they did.

No. 2 was working in the sump shaft of a large copper mine, where there had been great complaining about the large quantity of water they had to contend with, and for a long time but very little was done in the bottom of the mine from this cause; and this man being an intelligent miner and an able pitman, I made some en-

quiries of him as to his opinion of the doings at the mine, and he told me amongst other things that when the manager was expected everything was swept and garnished, but at other times things were left to take pretty much their own course; that to his certain knowledge the captain, smith, and pitman had drunk five gallons of beer together in the smith's shop in one week, and that he would undertake to keep the bottom of the shaft dry five days a week.

No. 3 had been to California, and was then working in a Cornish mine, and I asked him, as I generally do men I meet with who can be relied on, and have been in foreign countries, what he thought of Cornish mining as compared with the mining he had seen abroad, and wherein he considered we failed in not being able to get the same amount of labour done here as is done in America? And his reply was that if miners were set contracts at a fair price, and permitted to earn as much as they could, there would be no difficulty to get the work done. Upon my questioning the ability of our captains to fix fair prices, he said they ought to be able to do so, but stated that in passing through a stope in coming out of the mine the previous evening, in company with another miner, he asked the man how much ground he thought he could stope there in a core, and the man's reply was 3 fathoms. My informant was willing to reduce it to the minimum, and said that without the least exaggeration he considered a man could stope 1 fathom a core, and yet the men who worked there had 3*l.* per fathom for stoping it, and were only getting the ordinary wages allowed in the mine, and the captains (who are not what Mr. Ennor would call "book-learned men," but thorough practicals, of established reputation) were passing through the stope every time they went up and down the mine.

No. 4 had been working for four months in an extensive mine, where everything depended upon sinking, and he stated that during the whole of the time he had been there the engine-shaft had not been sunk 3 ft., nor the bottom ends driven a fathom, the result only of the constant recurrence of some minor hindrances to the pumping machinery.

These instances might be multiplied, but I think I have given sufficient to show that there is a great deal of lax management prevailing in our mines, and that it is high time for our agents to bestir themselves, and try to introduce a better state of things.

The champion of "Practicals" is much more practical than usual in his remarks in the Journal for Jan. 17, and divested of the unpardonable prejudice against preachers which it exhibits, and its introduction into such a subject, there is in this communication much that it will be well for our captains to heed. I cannot, however, agree with Mr. Ennor when he refers the poor results that have attended Cornish mining of late years to the inability of our captains to understand Nature's laws, &c. The enormous quantity of mineral we are raising is proof that our mines are not wanting in richness. It must be, then, that we lack the energy required to work them successfully.

AGENT.

N. ENNOR ON PRACTICAL MINING—No. II.

SIR.—In my last letter I remarked that England's Government officials are bound to furnish the miner with such a book as I have described. I could get up such a book, with all the drawings, but I am bound to admit that I am deficient in knowledge as to the laboratory department. Then, why should I do it? I am not a paid Government man. Were I such I should not have taken over two years to get it up. In that case the miner would have had it, and been eighteen years in advance of his present position. His cry now is only to be compared to that of the wood owl, ever the same cry—"The strata are highly mineralised." This sound would have long since have been obliterated from the Journal if such a book were placed in the miner's hands. Then three or four able chemists should be distributed about the county to test whatever should be sent them from the mines, they being paid 1*s.* 6*d.* for a rock assay and 2*s.* 6*d.* for every ore. Then the practical world master most of these required subjects, and face the wide world. He would no longer write his foolish reports. Such a book would be interesting, and very saleable, and be read by all connected with mining. Then, it is even cruel for England's paid men to delay in getting up such a book for the miners. Let them have it in plain spoken English chemistry, and with mining terms.

Chemistry appears to have been a mystery throughout all past ages. I have myself taken specimens of minerals to many of the most celebrated men in England and Scotland, not telling them what I expected were the contents, and no two agreed as to them. This makes me much doubt that these paid men are up to the mark. I do know that they, like the alchemists, are either deficient of chemical knowledge, or are determined to keep it to themselves. I am informed that a book of this description was promised before the Great Exhibition, and that a committee was to investigate it, but, unfortunately, some Yorkshire wag came in with a living frog, and drew off their attention, saying he had been working on the coal rock, when he shot down an immense mass of coal. On breaking it up he found this living frog, which he then and there produced. These wiseacres examined it; they set it down as having been in the earth from the time of the creation. I am not aware if any of them were Jesuits, but it is evident they thought it was a miracle. They became enraptured with it, and threw the miners' book aside. They held council as to what should be done with it. After a time it was decided to put it into a square sealed bottle with water and coal, and test its living abilities. They did so. Some went so far as to say they thought it would live as long as time. It was placed in a room in the great building, with a policeman to guard it. It is said that the room was visited by over a million of people to see this miraculous frog. I entered the room myself many times, and after about a week I saw the frog was dead; but I was not allowed to open the sealed bottle before the close of the Exhibition. A few days before I went in, and turned the bottle upside down, when it was admitted by all that it was dead. I think it did not live a week. I was threatened to be locked up for it, and I requested them to do so, as I intended to accuse them of cruelty to animals, when they were glad to get rid of me. I have no knowledge of what they gave the Yorkshireman for bringing it there, but doubt not that they paid him well, particularly so if they believed in miracles. When the frog was unshrined they found the Yorkshireman was gone, and the long-looked-for book lost. I do not remember the names of all those on the committee, but I venture to ask if Mr. Hunt and Mr. Fox were on it, as I am told they made an apology for its being put there at a public meeting in Cornwall. I now again ask them to get up this book in the next two years.

About 15 or 16 years since I was requested by Sir James Graham, Dr. Farr, and others in office to make a statistical return of what was done in the mines of Cornwall and Devon. They furnished me with all their parochial accounts. I had to return to them an account, stating how many mines there were in the two counties, how many steam-engines, how many agents employed, what number of men, women, and children employed directly, and how many indirectly, what coals were consumed, what quantity of each ore were raised and their values, where they are smelted, what amount of dues were paid, what quantity of china-clay was raised, its value and where shipped, and also granite. All this only took me a summer to do, as I was generally on my round. I would not engage to get up such a thing again, but it certainly opened my eyes as to the profits and losses in mining. I had to prove to them that the parish return of the numbers employed was by far too great. I had to reduce them by thousands. My returns were required as a check for the Government's guide. I think no mining statistical accounts were published for the year. I was thanked by the Government for my long and interesting report, and they offered me a Government situation, which I declined, my regular annual income being far more than the Government mine situation would bring me.

I think I may say that I have seen more of mines, and their ups and downs, than any man living, still I am a staunch advocate for legitimate mining. I ask what else maintains the millions? How would the masses live without mining and metals? N. ENNOR.

Robin Hood Hotel, High Holborn.

CHINA-CLAY IN CORNWALL.

SIR.—The statement made by a correspondent in the Supplement to last week's Journal as to china-clay in the St. Austell district—that it never looked more prosperous, nor sold at higher prices—is quite correct, and there is a large field open

for capitalists at the present time. With a moderate amount, judiciously laid out, large profits can be realised. And the writer is prepared to show that opening up new china clay works is no speculation but a certainty, with necessary capital to fully develop the works. A certain piece of land in the St. Austell district has lately been granted, with full supply of water for washing, a railway running through the site, and easy royalty. A capital of 500000 would fully lay open the works, so as to give 200000 per annum profits. This grant is situated in the immediate vicinity of works yielding 5000 tons of clay per annum of the very best sample. The demand for clay is steadily on the increase, and higher prices ruling both in the home as well as the foreign markets.

Roche, St. Austell, Feb. 4.

MAUGHOLD-HEAD MINING COMPANY.

SIR,—As one of the unfortunate shareholders in this company, may I venture to trespass on your valuable space for the insertion of the following:—In August last, acting upon the information of a prospectus, apparently bona fide and truthful, I took a certain number of shares in the company, relying on the integrity of its directors. Very good progressive reports have been issued from time to time. A bill has just recently been made, and at a time when the shareholders were looking for a dividend they are suddenly informed that unless they immediately raise a further sum of 50000, the affair must be wound up. Assuredly, Sir, this is a case where the directors were not justified in allotting, and if they did so they must have known at the time I subscribed that they were receiving money for a concern which there was no reasonable prospect of carrying through. It is a hard case for us, and from the little legal advice I have taken in the matter I am led to believe that I am entitled, with other holders, to have my money returned. I hope the shareholders, at the meeting convened for the 10th inst., will enquire into this.

Kennington, Feb. 2.

A SUFFRAGER.

WEST DOLCOATH MINE.

SIR,—The enquiry under this heading, signed "Truro," which appeared in last week's Journal, requires some notice, but no answer. If "Truro" be intended as an indication that the *quæst* enquirer lives there, it is very remarkable that he found it less trouble to write to the Journal and wait a week for a reply than to go at once to the Town Hall, which is no wonderful distance from any other place in Truro, and obtain in two minutes all the information he was so anxious to acquire after a lapse of at least ten days. Such anonymous enquiries as these have generally a sinister end in view, and reveal the foolishness of the individual, who is not sagacious enough to perceive that his communications are seen through. This wonderful inquirer reminds me of a correspondent who signed himself "Agent" (St. Just). His letters are many, and on the whole, shine in the matter called "rigmorole," or, in plain prose, what in common parlance is called twaddle. The sooner "Agent" (St. Just) concludes his lacerations the wiser on his own part, and to the intelligent readers of the Journal a matter of considerable relief. He appears to be so little familiar with scientific and practical mining that those who are, not knowing who the gentlemen is, entitled to ask—"Simon, son of Jonas, lovest thou me?" Mr. Editor, if I be not entitled to sign myself "Truro" I may presume to append the signature

TRUE, O!

MINERS' PAY—THE FIVE-WEEKS SYSTEM.

SIR,—In reading the paragraph in last week's Journal, relative to the proceedings of the general meeting of the Gawton Mine, it is gratifying to see that a movement is being made to re-establish the regular twelve months' system of pay, as formerly, the present one being unquestionably the most unsatisfactory. The suggestion of a combination is the right one, and should be formed on several accounts, which I believe would be beneficial in strengthening the interests of all mining adventures from intimidation on the part of the men. If two or three of the great leading companies would take the matter in hand it would bring full attention to the propriety of taking steps to effect it.—*Common street, Feb. 5.*

[For remainder of Original Correspondence, see to-day's Journal.]

Meetings of Public Companies.

LONDON AND COUNTY BANK.

The annual general meeting of proprietors was held at the Cannon-street Hotel, on Thursday.

Mr. FREDERICK FRANCIS in the chair.

Mr. GEO. GOUGH (the secretary) read the notice convening the meeting, and the report and balance-sheet, which will be found in our advertising columns, were taken as read.

The CHAIRMAN said that, the report and balance-sheet having been taken as read, it became his duty to make a few observations, but the duties of Chairman had been so frequently gone over by able men than himself, that it was reduced pretty well to rule. The first business was to make some observations on general matters, and foremost among these, in consequence of the enormous business carried on by this bank in the country, was the state of the agricultural interest. There was, doubtless, much to be said on this question; he lived in a wheat-growing district. Last season had proved the worst for the last 50 years, but barley and some other crops had done well, and he understood that the breeders of cattle and growers of hops had not much to complain of. The next important part of their customers were those connected with trade and commerce, which were, upon the whole, prosperous, but the silk and China trade had not been so successful. In financial matters the result had been favourable to bankers. Much money had been required from this country for Germany for their new coinage, and much had been absorbed by foreign and colonial loans, but these were not unprofitable to the capitalists of this country, since 30,000,000 per annum comes into their pockets from that source in the shape of interest. There had been no less than 24 alterations in the Bank rate during the year, the highest being 9 per cent., and the lowest 3 per cent. The probable movement in the rate cannot be foreseen a month in advance, so that it was impracticable at all times to provide for these changes, yet the result had been satisfactory to them. These were general remarks, which might or might not be of interest to them, but he would offer a few observations upon the report which must have a special interest. The first clause showed them that of the profit made there remained 169,0000, to be dealt with for the half-year. Of this they proposed to appropriate 120,0000, to the payment of the dividend; 25,0000, was transferred to premises account, as, in order to be able to carry on their constantly increasing business, they had been compelled to spend a large amount on premises; and there would be 24,0000, to carry forward. They could scarcely hope for so good a half-year as the last, and the directors, therefore, felt that instead of dividing every farthing they ought to apply something to premises account. He referred with much regret to the next paragraph of the report, recording the death of Mr. Jardine, who had been a most valuable officer of the company. Another important matter, perhaps the most important, was the proposal to increase the capital mentioned in the next paragraph of the report. At the meeting, when the matter was last mentioned, it was recognised as expedient to maintain the proportion between capital and liabilities. They knew that for the last ten years their customers' balances had been increasing at the rate of 1,000,0000 per annum, last year the increase was 1,100,0000, and since Christmas they had increased again. Keeping this in view, they had felt it necessary at once to issue an additional 15,0000 shares. The reserve fund could, according to their Deed of Settlement, only be put at half the capital; their capital would after this issue amount to 1,500,0000, and the reserve fund 750,0000. From the way in which it is proposed to call up the new capital, it would be seen that the profits would cover the calls. When this issue is completed it will increase the stability of the bank. As to registration, the bank had been registered as an unlimited company under the Act of 1862, and it was as well to explain to them, in order to remove a false impression that existed in the minds of some, that this did not alter the constitution of the company in any way; the liability remained unlimited as before, but it ceases one year after the death of a shareholder, or after he parted with his shares. The accounts were in such a state that he need not go into the details beyond stating that they showed they had 7,000,0000 available at any moment; the bills under discount—the most profitable part of the company's business—were 13,000,0000; they had paid 122,0000 for interest to customers, 118,0000 for salaries, and had then left the respectable sum for dividing amongst the shareholders which he had already mentioned. He thought this was sufficient to show that their accounts were in a highly satisfactory condition. The increase of the balance showed a progress which must be satisfactory to them all. They had opened 5000 new accounts during the year, and their shareholders now numbered nearly 3000. He concluded by formally moving the reception and adoption of the report and accounts.—Mr. W. CHAMPION JONES seconded the resolution.

A PROPRIETOR enquired whether there were any unallotted shares? The CHAIRMAN said there were none whatever. There were two or three scrip shares which had not been brought in for registration, and if these were not brought in soon the directors would consider the desirability of forfeiting them for the benefit of the shareholders generally.

The report and accounts were then unanimously adopted, and upon the proposition of the CHAIRMAN, seconded by Mr. W. NICOL, a dividend of 10 per cent. for the half-year was declared, leaving 23,9170, to carry forward.

The SECRETARY read the subjoined resolution relating to the proposed issue of shares referred to in the report, which was unanimously agreed to:—"That the 15,000 shares in the share capital of the company already authorised be offered rateably amongst the proprietors who shall appear registered in the books of the

company on March 31 next, such shares to be issued at a premium of 100 per share, and on the following terms and conditions:—1. That payments be made as follows:—70. 10s. per share on June 1, 1874; 70. 10s. per share on Dec. 1, 1874; 70. 10s. on June 1, 1875; and 70. 10s. on Dec. 1, 1875.—2. That 50. of each payment shall be on account of capital, and the remaining 20. 10s. of each payment shall be taken on account of the premium and added to the reserve fund.—3. That such payments, both on account of capital and of premium, shall bear interest after the rate of 5 per cent. per annum from Dec. 31, 1873, payable as hereinafter mentioned, from which date the payments on account of capital only shall be entitled to receive dividends after the same rate as the other capital stock of the company.—4. That instalments in arrear shall be charged with interest at the rate of 10 per cent. per annum, to be paid with such instalments.—5. That any instalment paid in anticipation shall not be entitled to interest until the date when such instalment becomes payable.—6. That the holder of scrip certificates (the instalments due thereon having been paid) shall be entitled to receive in respect of each share—On March 1, 1875, the sum of 5s., and on March 1, 1876, the sum of 10s., being interest at the rate of 5 per cent. per annum.—7. That on March 1, 1876, the scrip certificates (all payments thereon having been made) shall be brought in for registration, when a certificate for the relative number of shares shall be given in exchange, in the name of the person whose name in full, quality, and address shall be subscribed upon them, on the same being lodged at the London and County Bank, 21, Lombard street, and the Deed of Settlement of the company being signed.

Upon the proposition of Mr. W. CHAMPION JONES, seconded by Mr. W. NICOL, the retiring directors (Messrs. T. S. Cowie, F. Francis, and F. Harrison) were re-elected. And upon the proposition of Mr. MUNGO MCGEE, seconded by Mr. DUFFIELD, Messrs. W. Norman, R. H. Swain, and Stephen Symonds (the latter in the place of the late Mr. Jardine) were appointed auditors.

Mr. W. CHAMPION JONES proposed a vote of thanks to both the general managers and to the officers of the bank generally, and, in seconding the resolution, the CHAIRMAN mentioned that they had under consideration the establishment of a provident and superannuation fund for the officers of the bank when, from age or other causes, they might be unable to continue those services.—The vote was carried with acclamation.

Mr. M. KILWAN, on behalf of himself and the other officers of the bank, said that it gave him the greatest possible pleasure to tender their warmest thanks for the kind and generous manner in which the vote had been accepted. They had heard from the Chairman how their business was progressing, and with that progress they had a steady accession of profit. They had favourably received the reference to the premium account, and he might explain that they had not been in the habit of doing a large number of shares, but they had waited to see whether they had such a hold on the district as would justify an outlay on premises account, and he thought that no one could charge the directors with lavishness in that direction. The announcement of the Chairman that the directors would at the next meeting be able to bring before them a scheme for superannuation was one which he thought they might all be congratulated upon. He thought that when men had spent the best years of their life in their service they were entitled to such consideration, and he knew no way in which the interest of the officers could be more closely bound up with the interests of the bank.

Upon the proposition of Mr. ROSE, seconded by Mr. WATKINS, a unanimous vote of thanks was given to the Chairman and directors and duly acknowledged. The meeting then separated.

TECOMA SILVER MINING COMPANY.

A general meeting of shareholders was held at the London Tavern, on Monday. Sir ALEXANDER MALET in the chair.

The SECRETARY read the notice convening the meeting; and the report of the directors.

The CHAIRMAN said his first object in appearing before the shareholders was to repudiate and emphatically deny in the strongest terms that language could convey that there had been any understanding or bargain between the board and the vendors, by which they gained any appreciable advantage to themselves—that he most unequivocally denied. On March 27, Mr. Nicholas M. Maxwell took charge of the Tecoma Mines, the directors having no doubt that under his management the property would be efficiently worked; but certain laxities in not sending home accounts and deficiencies in organic regulations, induced the board to send out Capt. Forbes as supervisor of the mines, hoping that by concurrent and harmonious action those two gentlemen would have produced the most favourable results. Mr. Maxwell had told them that 15,0000 would amply suffice for all the purposes of the mines, but 18,0000 had been sent out when Capt. Forbes undertook the supervision. Capt. Forbes did not make any report to the board in any way impugning or rebutting the terms in Mr. Maxwell's original report upon which the property was acquired, and which was appended to the prospectus. He would ask the secretary to read the first letter from Capt. Forbes, dated May 4, 1873.

The SECRETARY read the letter, as follows:—*Wells Fargo, Salt Lake, May 4, 1873.*—To-day I received from your secretary a copy of a letter addressed by the board to Mr. Maxwell, dated the 8th ultimo, together with copies of two telegrams, the one sent by Mr. Maxwell to the board, and the other by the board to Mr. Maxwell. On April 29, wishing to communicate on an important subject with the board, and having no cipher, I wired in cipher to my brother, Major Forbes, who conducts my office, 44, Charing-cross. "Tell Gole, 49, Lime-street, must have all remaining Tecoma dollars remitted by wire to Wells Fargo." I have by this mail written an unofficial letter to that gentleman, who is one of your directors, entering into the subject. My reason for asking for all Tecoma funds was not the necessity of their immediate expenditure, but the necessity of the strengthening my position with the bankers of the various companies which I am here to represent. Tecoma is developing well, and rich ore is being found: 100 tons have been sent to the smelting works at Truckee, and I hope to be able to keep up a supply at the rate of 300 to 400 tons a month. Towards the end of the month we ought to be producing bullion, when I shall push development, and crowd the work generally. Assays of ore from this mine have proved so rich, that I forbear to mention them for fear of causing hopes which may not be realised in the long run, preferring the safer test of the value of bullion of which you will have due information. Owing to greater pressure of business at Flagstaff and Last Chance, I have been unable to visit Tecoma, or spare Mr. Maxwell, but shall do so as soon as I can, and spare no effort to get the mine into a dividend-paying shape. In the meantime the company have good agents to look after their interests in Mr. Grey and Mr. Wessels. They are fully supplied with all necessary stores, and the furnaces will commence running as soon as the necessary supply of ore is laid down.—C. FORBES.

The CHAIRMAN said that letter was written from hearsay, and before Capt. Forbes had visited the mine. He would now ask the secretary to read Mr. Maxwell's letter of May 15, and also Capt. Forbes' of May 20 and 28.

The SECRETARY read the letters, as follows:—*Flagstaff Furnaces, May 15, 1873.*—Enclosed I beg to hand you our mine agent's report, by which you will see that we are proceeding rapidly with the development of the mines, which are producing some very high grade ores. We have shipped 100 tons of ore to the furnaces (but only 58 tons has as yet arrived), and shall continue to ship as fast as possible. The works are all ready to commence smelting this day, but I telegraphed to them not to start until they have at least 150 tons in hand, so as to provide against any irregularity or delay hereafter in the transmission of bullion to the smelting works. On Monday, at the last of the month, the furnaces will be started. You will be pleased to see by the agent's report that the ores are running very high in silver and gold, thus bringing down cost of production in regard to value to a very low figure. We are burning charcoal extensively, and accumulating large supplies. All our buildings are now completed, with the exception of a boarding-house for the men at Truckee, and when this is finished our construction account will be closed. In a few days I will forward you full accounts made up to as late a date as possible: everything has been paid for, and have a fair balance on hand for proceeding with the development of the mines, which will be pushed to the utmost vigour, and I am sanguine that the property will prove of great value. I hope to be able to advise you very shortly on United States patents have been issued. It is only now a matter of course, as no opposition can be made.—NICHOLAS M. MAXWELL, Superintendent.

Tecoma, May 13.—We have shipped two carloads of ore to-day, and shall ship one to-morrow, and hope to ship one each day. We shipped about 6 tons of Gladstone ore to-day. Green has started his assaying furnace, and made four assays from North Drift first line Discovery shaft. Assay No. 1—Silver, 8975.54; gold, 43.85—No. 1019.39; No. 2, 88.56; No. 3, 8176.84; No. 4, 8184.65. These assays were made from ore taken from several different parts of the drift.—JOHN GRAY.

Virginia, Nevada, May 20, 1873.—I visited the Tecoma property on the 17th, and found the work on the mine pushing its development with 45 men. Substantial buildings have been erected, and all requisite supplies furnished. The Shanley has more developed than the other locations, and a shaft sunk 87 feet, at the bottom of which levels, 45 feet in length, have been run right and left, exposing a body of ore which may be safely estimated at 600 tons, the vein being on an average 5 feet wide in the southern level. I saw them break into a large bonanza 25 ft. in diameter; this ore is to be opened up at once, against my return on the 20th inst. On the Lumsden vein a shaft has been sunk 50 ft. with good indications. A tunnel has been run 58 ft. which will intersect both lodes at the Shanley at a depth of 243 feet. On the Gladstone vein a shaft has been sunk 81 feet, but the ore is not of a high grade. On the orbit but little work has been done. My present intention is to push the work on the Shanley and Lumsden, and get out 600 tons of ore, and thereby prove its value, and place myself in funds. They are shipping 10 tons per day to the smelting works at Truckee; I have ordered this to be increased to 20, and make the necessary arrangements for transport. On the 19th instant I arrived at Truckee, and inspected the smelting works: they are ready for smelting, and are convenient and commodious, and fuel is cheap, and the only drawback is the distance from Salt Lake, whereby control is rendered difficult. I have ordered that purchase of 200 tons of outside ore, as a good business may be done in this way when we have not sufficient ore of our own to keep the furnaces going. On my return to Salt Lake, on the 24th, I shall have made a second visit to the property, and had my assays of ore made, when I shall be able to report more fully on its merits than it is possible to do after one visit. The real test will, however, be in the amount and value of the 600 tons of ore, which I propose to smelt at once. As to-night will be the only night I shall have had in bed during this week, and as I am writing against time and under difficulties, I trust you will see that a detailed account of your properties will be more advantageously given on my return to Granite, to which address send all letters, &c., in future.—C. FORBES.

Flagstaff Furnaces, May 28, 1873.—I returned here on the 26th inst. From Tecoma, and will now give you a more detailed account of that property. From numerous samples which I took on the 17th, and which I had assayed at Virginia City, I find that the ore in the Shanley ranges \$10 to \$3500, but the latter quality of ore is only found in handfolds, here and there. The lower grade ore, from about \$20 to \$40, predominates, and consequently all ore for shipment has to be picked, an average of 2 to 3 tons of ore assaying over \$100, being obtained from every 10 tons of ore opened up. The ores generally carry a large proportion of gold, but are poor in lead, which will necessitate the purchase of ore containing more lead in order to smelt them. They can be readily obtained all along the line of rail between Tecoma and Truckee. On the 17th a bonanza was found in the south drift, which

had developed on the 25th to 45 ft. in length, 27 ft. in breadth, and 35 ft. in depth at one end. The extent of this deposit cannot be known for some time, the mine being so little opened up that there is no room for a large force of men, and all the hoisting having to be done by one shaft; in fact, until the tunnel gets in, about Sept. 1, no large results can be looked for. At present the daily shipment for Truckee averages 10 to 12 tons, and on the 26th 160 tons had been forwarded. The Lumsden shaft is still sinking; though 2 tons of good ore have been taken out, no body of ore has been found. The tunnel is progressing, but the rock is hard. I have ordered all other work here to be discontinued. I found 57 men employed, which number will be reduced, as there is no room for them to work yet. I found an exorbitant contract for hauling of 88 per ton, which I have reduced to 85, and hope to get it lower still; you will see that as it costs at present \$18 to convey the ore from the mine to the furnaces at Truckee, none but rich ore will pay to ship. All the buildings that have been erected are good and substantial. The Truckee furnaces I found in good order, and ready for smelting. I have ordered them to commence on June 15, by which time there will be 300 tons of outside ore to flux them with. As the purchased ore will be rich in silver and lead, a good profit ought to be made on this account. And there is no doubt that the Truckee furnaces ought to produce a good revenue out of this source alone, if the smelter is an honest and capable man, which in this country is not easily found, especially when he is at such a distance from control.—C. FORBES.

The CHAIRMAN said the shareholders would see that Capt. Forbes in no way impugned the statements in the prospectus, or said one word in disparagement of it, except that he stated there were only 600 tons of ore instead of about six times as much, as calculated by Mr. Maxwell. As neither of these servants of the company were present, he (the Chairman) was reluctant to say a word against them as to whether they had put forward facts, so that he must leave the shareholders to draw their own conclusions. The report contained two telegrams, which created an impression not justified by results; but there was another telegram he could bring under the notice of the meeting—that received by Capt. Forbes' brother on July 21, and it was important to recollect that this telegram was received after the reports had been made by Capt. Forbes, and when the shares were beginning to fall in the market. The telegram referred to was in the following words:—

"All d—d nonsense. Flagstaff netting 600 daily; Last Chance, 1700 tons good ore on hand. Tecoma rapidly developing. You all seem mad. Send no more telegrams—will not decipher. Do not go to the city again. Make this public."

On July 16 Capt. Forbes had written to say that Mr. Maxwell was overworked, and that it was desirable a new superintendent should be appointed at Tecoma, upon which the directors selected Mr. St. Stephens. They had been accused of receiving information of the falling off in the mine and withholding it. Now, Mr. Maxwell's letter, written on July 9, did not come to hand till July 29, when the directors deemed it their duty to write to Capt. Forbes, as the superior officer of the mine, for an explanation. Capt. Forbes' replies did not reach the directors till Sept. 7; a delay then took place, the directors hoping to receive Mr. St. Stephens' detailed and thorough report. Upon its receipt it was found that although he gave a very different value, and he (the Chairman) was much more inclined to lean to the opinion of Mr. St. Stephens, yet he had always considered the property a valuable one. He need not here go into any explanation about the ore bodies in the limestone formation giving different results, wishing more particularly to deal with the facts before them. Mr. St. Stephens required funds, and asked for 20000, increased to 30000, and then a total of 50000. They thought they could apply in no quarter so naturally as to Mr. Davis, the active agent in bringing the mine before the public. It was incumbent on the part of Mr. Davis to assist the board, and that gentleman advanced the sums required at an interest of 6 per cent., but being of the opinion the management had been extravagant, Mr. Davis made it a condition the administration of the funds and the working of the mine should be placed in the hands of a gentleman—Mr. Patrick—in whom he had the greatest confidence. Unscrupulous statements had been made by persons ignorant of the facts, that the mine had been mortgaged, or absolutely made over to Mr. Davis, which were totally untrue. Mr. Davis was to be repaid out of the net profits of the mine. He (the Chairman) much regretted that Mr. Davis and Mr. Patrick were not present. Letters had been received from Mr. Patrick to the effect that Mr. Davis, being too unwell to write himself, wished the meeting to be put off until he could attend. He had understood that in a low paper his character had been attacked, and contained insane malevolence, with the view, no doubt, of bringing into notice the obscure paper. His ability and judgment might be found fault with in reposing such confidence in the officers of the company, but no man should question his good faith. (Hear, hear.) Personally he had lost considerably in this enterprise. Neither he nor any member of his family had trafficked in the shares—they stood to lose or win. The share list would show he had been no trafficker in the shares, and no man should say he had dishonoured the name he bore. (Hear, hear.) He then moved that the report and balance-sheet be received and adopted.

Mr. FRAMES (a director) seconded the proposition.

Mr. MAITLAND (a director) said the Chairman had stated what he fully believed, but as shown by his (Mr. Maitland's) letter in the *Mining Journal* of last week, he was at issue with his colleagues with reference to the part of the report which alluded to the agreement with Mr. Davis. (He then read the letter referred to.) He stated that up to the present time the board had received from Mr. Davis only 2000. It was of importance that they should thoroughly understand matters. It was the common-sense practice of companies who had got into difficulties to adopt one course—that is, the shareholders should name a committee among themselves. (Hear, hear.) The whole of his colleagues were perfectly willing and desirous, for their own credit and for the benefit of the shareholders, that a committee should be appointed. There was nothing whatever to conceal, and therefore he would propose, as an amendment, that a committee of shareholders be appointed to enquire into the present position of the company, and all the circumstances connected with it since its formation, to have power to examine all books, documents, papers, and accounts, obtain all the information they may deem necessary, and report as early as possible to an adjourned meeting.—Mr. BURNAND seconded the amendment.

Mr. CREMONINI said the position of their Chairman to-day must be most mortifying to an Englishman. When he found that the directors, instead of calling the shareholders together when funds were required, had pledged the company's property, he really felt astounded that such men could be found. Such men were totally unfit for their position as directors. He held in his hand proxies from several shareholders, who felt confident he would do the best for their interest according to his ability; and, as their representative, he said the least the board could do was to resign the management into the hands of the committee which he hoped would be appointed.

Mr. BURNAND said the directors were answerable for the statements in the prospectus. They were now with 190 at their bankers, out of a subscribed sum of 300,000. One of the instructions of the committee should be to proceed against the vendor.

Mr. J. H. WILLOCK said there was not a man in that room who would have subscribed for a single share had it not been for the once-honoured name of their Chairman. (He then proceeded with a long statement, in which he used some strong terms, which we refrain from publishing from a wholesome fear of the law of libel. He stated at a subsequent part of the meeting that, although he had been a considerable loser, he at present held five shares.)

Mr. GARNE hoped that when this committee was appointed all the proceedings from the commencement of the company should be investigated. The sooner the directors were removed the better, but he should not move their responsibility. Mr. STURGES said he had taken some trouble with regard to this company. When he took shares he thought there might be some risk in finding ore, but did not think he was running any risk as to the bona fides of the enterprise, with the honoured name of their Chairman at its head. The foundation for starting the Tecoma was laid by speaking of Mr. Maxwell as an independent gentleman, whereas Mr. Maxwell was nothing of the kind—that is, if the term meant a gentleman of fortune and position. (Cries of "Time, time.") He found that one of the directors (Mr. Frames) had taken ten shares.

Mr. ANDREW said he heard that Colonel Stanford said a few weeks since that the whole thing was a swindle.

Colonel STANFORD said he had again and again stated the result had never justified the report made by Mr. Maxwell. He (Colonel Stanford) had been as great a victim as anyone in becoming the promoter of the company. The property was introduced upon Mr. Maxwell's report, and he (Colonel Stanford) said that fact had not justified that report.

A SHAREHOLDER: Who sold the property?—Col. STANFORD: Dr. McGrath.

A SHAREHOLDER: Did you get any of the purchase-money?—Col. STANFORD: No, not one farthing.

Mr. BALSTER said all these points would be investigated by the committee. Mr. T. G. TAYLOR thought it a great pity Mr. Maitland, the director who now proposed the appointment of a committee, had not found out that critical position of the company some months since. When Capt. Forbes was sending home telegrams "You must all be mad in London—Tecoma is richest," his shares were being sold. There must be a committee.

A SHAREHOLDER suggested that the committee should have power to negotiate with Mr. Davis with the view of recovering some portion of the purchase-money.

A SHAREHOLDER: Was Col. Stanford a vendor or not?—Col. STANFORD: I will leave that to your committee to find out.

A SHAREHOLDER: Who were the vendors?—The CHAIRMAN: As far as I know, Dr. McGrath, Col. Stanford, Mr. Davis, and the other names in the deed, a copy of which was in the office.

Mr. GOLE said an official copy of the deed was at the office of the company,

where it could be seen. Col. Stanford's name was not in the deed.—After some further discussion it was unanimously resolved that Messrs. W. H. Barnard, J. H. Willock, T. Cremonini, A. Mackenzie, and C. C. Adley were appointed the committee.

Major FORBES suggested, as a consideration for the committee, that the whole of Capt. Forbes's correspondence should be printed and forwarded to the shareholders, so that they might be able to judge for themselves. He (Major Forbes) would bear the expense.—Mr. BURNARD seconded the proposition.

Altho' Sir LEOPOLD HEATH said that, as a brother's character had been called into question in his absence, he hoped the meeting would adopt the recommendation made by Major Forbes.

A SHAREHOLDER thought this meeting should not be made a party to any personal question, the more especially as there were evidently points at issue between the Chairman and Capt. Forbes.

The recommendation was adopted as an instruction to the committee.

Mr. T. G. TAYLOR asked when the board would take their fees?—The CHAIRMAN said when the shareholders had received a dividend of 12 per cent. the board proposed to talk about fees.

A vote of thanks having been passed to the Chairman, the meeting was adjourned till March 3.

LONDON AND CALIFORNIA MINING COMPANY.

A general meeting of shareholders was held at the Cannon-street Hotel, on Thursday.—Mr. C. WRIGHT in the chair.

Mr. SAUL (the secretary) read the notice convening the meeting.

The report of the directors stated that the accounts were made up to Sept. 30 last, which show a loss on the half-year's working of 10,695*l.* os. 9*d.* This, added to the amount of loss shown by the previous report—15,948*l.* 16*s.*—makes a total loss of 25,744*l.* 16*s.* 9*d.* on the company's operations since the purchase of the three mines.—Erie and Pennsylvania Mines. The directors deeply regret that the unpromising state of the Erie and Pennsylvania should have obliged them to suspend all work at those mines; but while it was proper to explore the mines thoroughly, yet having done this, and there being no discoveries of ore made, it became evident that the time had arrived when, however reluctantly, the directors felt it their duty to stop all further expenditure in that direction, and to concentrate their whole resources on the more promising Amador Mine, and it is hoped the shareholders will take the same view and approve of the course pursued. The work done at the Amador is about what was expected would be accomplished, and as the mines on this lode (the Mother Lode of California) are even more productive than ever, there still seems a reasonable hope that the company's mine may ultimately prove remunerative.

The CHAIRMAN said he had been unexpectedly called upon to take the chair owing to Mr. Price having been compelled to absent himself from a death in his family. At this meeting there would be no necessity for saying a great deal upon the state of the company. It would be remembered that in February, 1873, a scheme was proposed, and a time taken for the completion of certain work which was necessary for the development of the mine. The time was 20 months, and the money 30,000*l.* The time would not be reached till about September or October, and it was very likely there would be some difficulties which could not now be foreseen, so that the result of the working might not be known until this time twelve months, although it might be known sooner. The loss upon the working during the last six months had been 10,000*l.* The board were very sorry to have to announce such a result, the more especially as the loss previous to that amounted to 15,000*l.*, making the total loss to the company from the commencement 25,000*l.* Since last meeting they had closed the Erie and Pennsylvania Mines, which had been for a long time in a very unsatisfactory state. They were now devoting the whole of their strength upon the best mine—the Amador. This step was not taken until after the mines had been thoroughly examined by Mr. Johns, the superintendent of the Amador, and Mr. Clift, both of whom recommended that it would be better for the company to concentrate the whole of its efforts upon the Amador; therefore, after more or less correspondence with their agents, the board at last succeeded in closing those two mines. The right of way through Pennsylvania had been leased to a party who had struck a vein which could be reached better from the company's shafts than from any other point. They had entered into an agreement with the company for three years to keep the mine in good working order, so that they could, if they so determined, resume operations at Pennsylvania. With reference to the original Amador, he might mention that it was one of the mines on the "Mother Lode" of California, and the general opinion was that when the productive depth had been reached it would prove equally productive with the other mines situated upon that celebrated lode, and until then they could say very little about the Amador. In December 260 ft. had been sunk, leaving 140 ft. to complete the depth which they were endeavouring to attain to reach the ledge. The Hayward Amador was 600 ft. deep, where the quartz was richer than ever. There were 12 or 14 other mines upon the same lode very productive, which was a very excellent feature with reference to the Amador. They were not working in perfectly poor ground, for the district was auriferous, and Mr. Johns was doing all he could to discover the lode. The board had every confidence in Mr. Johns; therefore, they must patiently wait results. Messrs. Cross and Co., the agents of the company, say in their report that—

"The total quantity of ore crushed has been 449 tons, which yielded in bullion \$8294.51, or an average of \$18.47 per ton, which is more than sufficient to pay the cost of extraction; and there are remaining on the dump 151 tons, which cannot, however, be milled until the winter rains set in, as there is no water available even for steam purposes."

With reference to the present condition of the mine, he might mention that the "clean-up" for December amounted to \$5000, from \$19 rock. They had received a telegram that morning, which he could not say was very hopeful; it was as follows:—"Amador Shaft, 9 ft. below seventh level, ground very hard, strong lode but poor, prospect better at north end of claim." It was at that portion of the claim that they had always looked for the discovery of riches. Messrs. Cross and Co. say:—

"At the Amador Mine we still venture to entertain good hopes that in depth our expectations will be fulfilled, although the operations so far have been less encouraging than could have been wished. Other mining enterprises have passed as dark and discouraging times as we have, and with prospects no more promising have attained great results; and that this company may do likewise is quite possible, and that such may be the case is our earnest desire and aim."

He then referred to the leading items in the balance-sheet, enumerating the loss resulting from the respective mines, adding that one could not help contrasting such unsatisfactory results with the reports of Messrs. Janin and Ashburner. One could scarcely comprehend how gentlemen of great skill, with a reputation and thorough knowledge of the mining district, could ever have penned such a report as to have induced this company to have acquired the property, in which Mr. Janin estimated that the three mines would a profit of 76,800*l.* per annum. Perhaps the better man the more likely was he to impose upon men; it could scarcely be conceived as possible that men in such a position could have penned such a report upon such a property as this. All he could say was that it was a most lamentable state of things. He believed that, notwithstanding this fact, their neighbours in California had as high an opinion of them as before; it might be that gentlemen who could convert geese into swans were the parties whom they best liked; however that might be, he understood that notwithstanding their untruthful report, Messrs. Janin and Ashburner's reputation had not been affected in California. He then proceeded to enumerate the items of expenditure at the various mines for the six months ending Sept. 30, stating that Messrs. Cross and Co. had reduced their salary from 2400*l.* to 1200*l.*, and Mr. Oliver from 720*l.* to 360*l.* per annum; the London expenses amounted to 316*l.*, including petty expenses, printing, stationery, salaries, and rent of office; the directors had not taken fees; and he did not think the London expenses could be reduced to a smaller amount. He wished he could lay before them a better state of things; it was very curious the way in which this property was brought to their notice; there seemed to be a concurrence of fortunate circumstances for the vendors to pave the way for its introduction upon the London market. The death of two partners made it appear a very legitimate reason for offering it for sale; the Sierra Buttes then yielded more gold than before, which seemed to throw dust in their eyes to blind them as to the real state of things. Looking at the organisation, it seemed to be perfectly safe, after the experience at Sierra Buttes, in taking the opinion of Messrs. Janin and Ashburner, but results had proved otherwise; yet there was hope, because until they had reached the magic depth of 700 feet they could not really say what would be the future of Amador. The Mother Lode had been a good mother to many, and he hoped it would be so to the London and California Company. If they should succeed in getting a little better ore they would go through the next six months without so much loss as the serious one embraced in the present accounts; at all events, no money would be frittered away unnecessarily, while every endeavour would be made to develop the mine in a satisfactory manner. The good faith of the directors was shown by the fact that they and their friends held

two-thirds of the entire stock of the company, which represented no less than 280,000*l.*; he believed none of them had sold their shares, he was sure every member of the board deeply sympathised with the whole of the shareholders, and would only be too happy to do anything they possibly could to help them. Although it was exceedingly irritating for a respectable body of gentlemen to be made the dupes of designing men, no one would be more pleased than the directors if at the end of the next six months they were able to announce the Amador had been proved to be a paying mine.

Some discussion took place in which Mr. Surgey, Mr. Greaves, Mr. Berthell, Mr. Bolton, and others took part.

The report and balance-sheet were received and adopted.

A vote of thanks to the Chairman and directors closed the proceedings.

WESTERN ANDES MINING COMPANY.

The first meeting of shareholders was held at the offices, King-street, Cheapside, on Saturday.—Mr. BRANDON in the chair.

Mr. T. JERVIS (the secretary) read the notice calling the meeting, and the directors' report was taken as read.

The CHAIRMAN said that the directors had called the present meeting because they were bound to do so by the Articles of Association, otherwise they would have preferred leaving it until one year after the company had been in possession of the mine, in order that they might lay before the shareholders a full statement of the expenditure, and show the profits which had been derived. He thought, however, that he could tell them pretty well what the accounts up to the present time would show, although he could not give them any details. The company had been in possession of the mines only seven months, and as those mines were thousands of miles away, the directors were not in a position to lay full accounts before the shareholders. He would make one remark with respect to a circular which had been issued by some gentlemen; although, no doubt, that circular was issued with the very best intentions, yet the directors felt themselves bound, unwillingly, to repudiate it. Under the circumstances, the directors could only say that it was very well intentioned, no doubt, but sometimes zeal overstepped discretion, and they would, therefore, pass it over. (Hear, hear.) They would see that the product up to September, free of cost, was 3017*l.*; he might supplement that by the October and November returns. October showed a product, free of cost, of 1634*l.*, and November 2052*l.* The agent stated that there were two small sums not accounted for in July, amounting to 91*l.*, so that brought out the total product, free of cost, of 12,755*l.* for the seven months. The vendor guaranteed 15,000*l.* a year of product, free of cost, but if the product continued at the same rate as it had done up to the present time it would amount to over 20,000*l.*, which was equal to about 24½ per cent. on the capital. (Cheers.) There was the cost of the formation of the company, law expenses, advertising, and so on, which amounted to 1648*l.*, leaving 11,148*l.* after deducting that sum. There were the current expenses for a period, in fact, of 13 months, for the company had been formed 13 months, which amounted to 202*l.*, leaving 10,947*l.*; the directors had paid dividend and interest to the 24th of this month, which amounted to 544*l.*, so they had absolutely earned within seven months 5303*l.*, over and above the dividend of 12 per cent., which the shareholders would have to decide what to do with. (Cheers.) He had made a calculation that, supposing this average were continued, and the directors had every reason to suppose it would continue, and the two last months of October and November pretty well showed that they were right in their anticipation; supposing that was so, that would yield, after deducting every cost which could come against it, 4122*l.* more, leaving at the end of the year 9455*l.*, or equal to about 12*s.* 6*d.* per share beyond the 12 per cent. (Hear, hear.)

He moved the adoption of the report and accounts.

Mr. MICHAEL seconded the resolution.

A SHAREHOLDER said he did not wish to raise any acrimonious discussion, but he should like to know whether the circular was sent out by friends or foes?

The CHAIRMAN said it was not sent out with the knowledge or authority of the directors. He believed it was sent out by some persons having a great interest in the mine, but the directors did not want those persons to state what they themselves wished to state to the shareholders. The directors would be able at the next meeting to give further particulars on the subject.

The resolution was then put and carried.

The meeting was then made special for the purpose of electing trustees.

The CHAIRMAN said that two trustees had to be appointed—one a friend of the directors and the other on behalf of the shareholders. He had himself been nominated a trustee on behalf of the directors, and Mr. Oldenshaw was proposed on the part of the shareholders.

On the motion of Mr. LOUD, seconded by Mr. BURRAGE, the election of Mr. Brandon and Mr. Oldenshaw as trustees was confirmed.

On the motion of Mr. DAWSON a cordial vote of thanks was passed to the Chairman and directors, and the meeting broke up.

IMPERIAL BRAZILIAN COLLIERIES.

An extraordinary general meeting of shareholders was held at 22, Queen Victoria-street, on Wednesday, for the purpose of sanctioning, if thought proper, by special resolution, the issue of 3000 of the shares of 5*l.* each, being part of the original shares unissued, as 15 per cent. first preference shares; and for the purpose of considering, and, if approved, authorising, an agreement between the company and one of the directors for the supply of floating stock; and to pass such special resolutions as may be deemed necessary to vary the Articles of Association, to enable such director to enter into the said agreement.

Lord BINGHAM in the chair.

Mr. DAVID L. DUVAL (the secretary) read the notice convening the meeting.

The CHAIRMAN said that at the last general meeting the directors pointed out the necessity of issuing the remainder of the unissued capital (25,000*l.*), when a committee of shareholders was appointed to meet the board, to consult with them as to the best way to issue it. After some deliberation the committee proposed these terms—to issue 15,000*l.* in debentures bearing 10 per cent. interest, with the option of conversion into ordinary shares within five years, during which period they were to be payable. The committee were prepared to at once guarantee 5000*l.* of the proposed issue, provided they had the option of taking up the remainder during a stipulated period; upon the completion of the arrangement they would require three seats at the board, and one of them being the brother of the company's agent in Brazil the terms could not be accepted without appealing to the shareholders. A letter was subsequently received from the committee, to the effect that as it was probable the terms would not be accepted the offer must be considered as withdrawn, and Mr. Goodall suggested that the board should prepare another scheme for raising the necessary additional capital, for submission to a special meeting of shareholders. The directors reconsidered the matter, and the result was that they decided upon recommending the issue of preference shares, bearing 15 per cent. interest. They did not issue a prospectus, in consequence of having received a very satisfactory letter from Mr. Johnson, dated Nov. 19; but they found that the capital could not be obtained without first obtaining the sanction of shareholders. It was now proposed to raise the capital by preference shares, bearing 15 per cent. interest. In the present condition of the collieries it was quite indispensable they should have a floating stock. The last advice from Mr. Johnson stated that he had been unable to satisfactorily progress with the works, because he had no floating stock nor working capital. One of the directors, Mr. Bower, had made an offer to provide floating stock, which the board considered could not fail to be advantageous, because the steam-tug and barges could be offered at once. It was proposed to have in the first instance one steam-tug and four iron barges, carrying 40 tons each. Of course, it would be preferable for the shareholders to subscribe the necessary capital, and themselves purchase the floating stock. It was now for the meeting to decide whether they would sanction such an arrangement or not. He then moved that the directors should be authorised to issue as preference shares such number, not exceeding 5000*l.* of the original share capital now remaining unissued, to bear a preferential dividend not exceeding 15 per cent., payable out of the first net profits or annual income of the company.

Mr. LAITY seconded the proposition.

The CHAIRMAN, in reply to a question, stated the preference shares could in no way interfere with the debentures, as they were the first mortgage.

Mr. ROSS (a director) explained that the reason the board wished to be authorised to issue preference shares to the amount of 25,000*l.* was this—if only 15,000*l.* were authorised the amount could not be altered if at any time that further amount should become necessary. If the colliery satisfactorily progressed hereafter it would be to their interest to pay off the debentures—the holders had only the right to exchange into ordinary shares, and of course the directors would never dream of giving them preference shares. Supposing the colliery were brought into a satisfactory state, the remainder of the unissued capital could be issued, and the debentures paid off—that was the only and sole intention of the additional 10,000*l.*, simply to pay off the debentures if a favourable opportunity arose.

A SHAREHOLDER said that would be merely altering a temporary into a permanent charge, as the debentures could be paid off upon six months' notice.

A SHAREHOLDER said, as a lawyer, he considered they should have power to pay off the debentures with preference shares, but it was not necessary they should bear so large an interest as 15 per cent.; the object was they should run *pari passu*, and that one should not have the advantage over the other. He could see no objection to the proposition.

Mr. LAITY said that the last letter from the colliery, dated November, stated that 20 to 25 tons of coal were being raised daily, and Mr. Johnson hoped that the output for the month would be 600 tons, but he complained he had no means of conveying the coal, nor any working capital. There was no question about the coal. The original shaft was half a mile distant from the present one, and there

were 11 galleries at work. He (Mr. Laity) was quite satisfied it only required management to ensure success, but it was of no use without good management. Including the purchase-money, they had expended nearly 80,000*l.*, and it seemed preposterous for the want of 10,000*l.* to let the property slip out of their hands; 45,000*l.* had been expended in stock, &c., tramways, locomotives, winding-engines, &c., it only required first-class energetic management, to ensure which it was proposed to supersede Mr. Johnson, as they had another manager in view. As to Mr. Bower's proposition, it was to the effect that he would send out at once four iron barges and one steam tug at his own expense, upon the condition he should be paid so much per annum for six years, but if the company should raise capital upon these preference shares they would have the power to purchase the barges. The only advantage of the offer was that the much needed floating stock would be sent out at once, and proceed to business. Mr. Bower offered these at 2500*l.* a year upon the redemption principle, and to advance 7500*l.*—the steam tug was to be 20 horse power, and four iron barges of 40 tons each. Mr. Bower made the offer in the interest of the company. He (Mr. Laity) had had several estimates from different shipbuilders, but Mr. Bower's offer was much below any of them. Their coal had realised 37 to 40 milreis per ton, and the price was now higher. It was found that the coal improved in depth. If the offer were accepted two barges could be built and sent out in two months.

Capt. FOWLER read extracts from a translation of an article which had appeared in a local paper, which confirmed the statements of the manager.

After some further discussion the resolution was put and carried, as also one altering the Articles of Association to enable the directors to accept the offer of Mr. Bower, the full terms of which will be submitted to a special meeting.

A vote of thanks to the Chairman and directors closed the proceedings.

THE MOLD-ARGOED COLLIERY COMPANY.

The second annual general meeting of shareholders was held at the company's offices, Fenchurch-street, on Monday.

Mr. F. BENNOCH in the chair.

Mr. H. R. DUKE (the secretary) read the notice convening the meeting and the report of the directors, together with the statement of account, showing a profit on the year's trade account of 2493*l.* 11*s.* 2*d.*, an available cash balance of 1761*l.* 12*s.* 5*d.*, and a balance to be carried forward on profit and loss account (after payment of the proposed dividend of 10 per cent.) of 106*l.* 16*s.* 3*d.* were submitted.

The directors report that the amount of coal raised during the year was 14,231 tons, realising 8856*l.* 12*s.* 4*d.*, and after deducting wages, royalty, salaries, directors' remuneration, railway carriage, wagon hire, and other expenses, they remain, with the 113*l.* 5*s.* 1*d.* brought forward from 1872, a balance of 2496*l.* 16*s.* 3*d.*, out of which the directors recommended that a dividend of 10 per cent. be declared, which will absorb 2500*l.* (less interest at the same rate on amounts paid on shares after Jan. 1, 1873, until date of payment), and that the balance be carried forward to the credit of next year's account. The work accomplished during the past year has been the sinking of both pits to the Main coal, the opening out of the Hollin seam, the completion of railway from the pit's mouth to the London and North-Western line at Mold Station, the addition of sundry items of necessary machinery, plant, and buildings, and other matters incidental to the development of the colliery. The whole of the coal won and sold during the year has been extracted from the Hollin seam; drivings have, however, now been commenced in the Main coal, which is upwards of 7 ft. in thickness, and of excellent quality, so that workings will be carried on simultaneously in the two seams. The present daily output from the Hollin is about 120 tons, which will be gradually increased to 150 tons, and will be augmented by about 50 tons from the Main seam, so that an output of 1000 tons a week may be shortly looked for. A market is readily found for the coal, locally and otherwise, the present price for screened being 1*s.* 6*d.* a ton at the pit. The cost of development generally, and of the railway and cart road in particular, has somewhat exceeded the estimate of the directors, and they propose, therefore, asking the consent of the shareholders to an issue of 2000 new shares of 5*l.* each, to be first offered to existing proprietors *pro rata*, which will increase the capital of the company to 35,000*l.* The issue of this further capital is rendered the more necessary from the fact that in consequence of the scarcity of house accommodation for the men in the town of Mold the directors have secured an eligible piece of freehold land close to the colliery for the construction of from 25 to 30 cottages, which will be eagerly taken by the men, and, in addition to other beneficial results, will, it is estimated, return at least 10 per cent. on the outlay. Now that the development of the colliery has been so far completed, the capital account will, with but few exceptions, be closed, and the directors are convinced that henceforward their main aim will be to realise a profit.

The CHAIRMAN said that, in moving the adoption of the report and accounts, he would mention some few matters connected with the company, which had now been in existence for two years. The accounts showed the result of the working of the company, and they would see that all the share capital had been paid up, and that much work had been done in the development of the company. They had established almost every matter necessary for the successful working of the concern, and many of the items were large ones; the railway was completed, they had got to the Main coal, erected new engine, purchased new boiler, enlarged their brick field, and they had made a junction with the North-Western Company's railway at Mold, so that they could now fill their wagons (they have at present 30, and will shortly increase the number to 50) at their pits, and send their coal to any part of the kingdom. This was almost an unparalleled success, but they were enabled last year to make such good progress owing to the exceptionally high price of coal. They had been enabled to give them 2½ per cent. dividend last year, and this year they recommended the payment of 10 per cent. Yet hitherto their workings had been confined to the drifts going southward and northward, and working only for the laying open of the coal, in order to enable them to obtain the whole seam without waste in working back. In carrying on their operations they had had some anxiety, as at one end of the property to the rise they were aware that there existed old workings which were filled with water. As they approached these old workings the men were naturally most anxious for their own safety, especially as the workings mentioned had been stopped by an inundation, by which some 30 lives were lost—the consequence of this was that the progress was slow for some time; now, however, the old workings had been tapped and the water drained off, the men celebrating the event by the hoisting of flags and general rejoicing. Their output of coal was at once increased from 50 or 60 tons per day to 100 or 120 tons per day, and he did not doubt that before Midsummer they would have an output of 1000 tons per week, which would be further increased when they got to the Cannel. It was a very favourable and exceptional case for a colliery to pay, as this had done, a dividend in the first year of working, and for the past year they proposed a dividend of 10 per cent. As for the future their hopes remained undiminished; their fixed expenses would be the same, and their returns larger, so that their profits would probably approach 20 per cent. In that event, it would be proposed to apply all beyond the 10 per cent. to the creation of a redemption fund, so as to pay back the capital in a fixed number of years. He then showed a plan of the workings, and explained that they intended to use quarter by quarter a different coloured ink, so that the amount of work done during any given period could be seen at a glance. The Main coal had exceeded their expectations, for not only had it been found to be the best in the neighbourhood, but it was a foot thicker than they anticipated, being 7 ft. thick. They had remodelled the whole of their offices at the mine; they had new good stables, smiths' shops, &c., and were also providing cottages for the men, as their having to walk three or four miles to their work was found to be very inconvenient, and to seriously interfere with the supply of labour at the colliery. The company had, therefore, secured a piece of freehold land close to Mold and to the colliery large enough to build 25 or 30 cottages. Although it had frequently been stated to the contrary, they found that every attention which they gave to the comfort of the men was fully returned; they found that the more they did for the men the more the men would do for them. In their brickworks they had an abundance of clay, and were thus able to make all the bricks required for sinking, as well as for the surface works. With regard to the disposal of the coal they got all the cream of the land sales, and, in consequence of having made their own road, they had the further advantage of having no toll between the pits and Mold. They had Mr. Boosie as their general engineer and manager, and in him they had a thoroughly competent man, and it was gratifying to find that great satisfaction was felt with him both by employers and men; for, as usual, when there was sympathy between the employers and the men matters always go on smoothly. He congratulated the shareholders in possessing a property at once so compact and so valuable, for when they saw other companies with much larger capital promising only the same output as they were actually getting there could be no doubt that their property really was valuable. Looking round everywhere, they seemed to be the centre of a nucleus of important industrial enterprises, and, therefore, must be successful. He concluded by formally moving the reception and adoption of the report and accounts and the declaration of a dividend of 10 per cent., payable on March 14.

Mr. S. WALCOTT, C.M.G., seconded the resolution, remarking that, as a holder of 222 shares, he was quite satisfied with the enterprise. He visited the colliery underground not long ago in company with the Chairman, and was perfectly satisfied with how things were being carried on.

Mr. ANDREWS observed that the Chairman stated last year that the output was 50 tons per day, and from the figures now put before them it appeared that the average for the past year had been but 50 tons per day. He would ask why it had not been increased, seeing all the inducement there had been in the shape of high

prices for coal, especially as they could not expect another 1873 for coal prices. As to the new capital which it was proposed to raise, he would suggest that instead of creating new shares, they should issue debentures at a fair rate of interest, say 6 or 7 per cent., which could be paid off as they thought desirable. He was pleased to hear the Chairman speak of the creation of a redemption fund, as the better provision made for that the better their property would stand. He thought, too, that the brick account and the coal account should be kept separate, and that the coal account should be charged with all bricks used. The building of the cottages he considered to be a judicious step.

The CHAIRMAN explained that the brick account had been kept separately, but hitherto there had been no profit and loss account for bricks, because they had had no bricks to spare; had they not their own bricks they would have had to expend 5000. In the purchase of them. The output had remained stationary because they did not get down to the Main coal so quickly as they expected; owing to the water the output of Hollin coal was restricted. As to debentures, some of the largest shareholders had been consulted, and they were in favour of issuing shares; the proportion will be 1 in 3, and he had no doubt that the whole would be taken by the shareholders. Their contracts for coal were to the extent of 1400 tons per month, at present prices, and they had about 40 tons per day laid sale.

The reception of the report and accounts and the declaration of the dividend were then unanimously agreed to.—Mr. Peirce was re-elected director, upon the proposition of Mr. DANIEL, seconded by Mr. ANDREWS; and Mr. M. W. Carr was re-appointed auditor, upon the proposition of Mr. PEIRCE, seconded by Mr. WALKOVITZ; the proceedings terminating with an acknowledgment of the valuable services of Messrs. W. and Isaac Hopwood and a vote of thanks to Mr. Bosio, the surface manager.

At an extraordinary meeting held immediately after, the CHAIRMAN stated that the meeting was called to increase the capital. There were several reasons for it, but especially the increase in the cost of labour and materials. Again, the North-Western Company gave them an estimate of about 3000. for the works at the junction, but owing to the change in the price of labour and materials this was subsequently altered to 7490. the company to pay more or less, according to actual cost of the work, but it would exceed the 7490. considerably. It was desirable that they should be in a position to work the three seams simultaneously, and after carefully considering the expenditure they would have to make they thought they ought to have an additional 10,000. Their great urgency was to have the means of sinking to the lowest seam. He concluded by reading the resolution.—The resolution, having been seconded by Mr. GAMBLE, was unanimously agreed to, the proceedings terminating with cordial votes of thanks to the Chairman, directors, and secretary, appropriately acknowledged by Mr. BENNOCH and Mr. DUKE.

HOBBS HILL MINING COMPANY.

The general meeting of shareholders was held at the company's offices, New Broad-street, on Monday, Mr. A. F. PAULL in the chair.

Mr. G. E. SIMPSON (the secretary) read the notice convening the meeting and the statement of accounts, showing a profit on the 12 months' working of 987. 5s. 2d. were submitted.

The directors reported that at the meeting in May they stated that they had just purchased a considerable quantity of effective machinery for an adjoining mine, that they were in treaty for the purchase of a Blake's stone-breaker, and were constructing a lead within the boundary of their own sett. The report of Capt. Peirce shows the completion of what they thus contemplated, and that within a few weeks the additional frames and dressing appliances will also be added, whilst the accounts show the cost of this work, amounting in all to about 2000. More than half of the forfeited shares have been placed at 15s. per share, of which a considerable number were taken by Mr. Murray (your present director) some months ago, whilst the works were still in progress, and after satisfying himself of the value of the mine by a personal inspection of it.

Capt. James Peirce reported that there is now clean, and ready for market, about 2 tons of tin, and a stock of 50 tons on the floors, equal to 7 or 8 cwt. of tin. There are engaged in dressing two men, nine boys (or youths), and one girl; in tending masons, carpenters, and assisting in the erections generally, four men; one smith; to keep stamps in order, one; carpenters two, and three when convenient. When the work of erecting machinery is completed the monthly cost will be about 1000. and the monthly returns of tin 30 or 35 cwt. The wet weather has very materially interfered with the men working in the quarry, to break stuff to supply the stamps, and yet more stuff has been stamped than could be saved and dressed with the existing machinery. One fifth of the time in stamping has thus been lost. With fine weather, and on the completion of frames, buddle, drag, &c., the returns will be proportionately increased.

PARRY MOUNTAIN MINES COMPANY.

The annual general meeting of shareholders was held at the offices of the company, 20, St. Helen's-place, on Thursday, Mr. P. BRADY in the chair.

Mr. P. R. WILSON (the secretary) read the notice convening the meeting. The report of the directors, together with the agent's report, were submitted and passed.

The directors regret to inform the shareholders that the funds of this company have again nearly come to an end, and there is no alternative but to issue the re-saved shares or to wind up, and they desire, preparatory to the meeting, to call attention to the following facts and figures.

The objects of the company at starting were:—
1.—To get under the great open-cast, from which copper ores to the value of 5,000,000. were formerly extracted, and never proved below the present bottom of the cutting. Towards this 90 fms. level has now been driven 55½ fms., at a cost of 3571. 3s. 8d., and has still 60 fms. to reach the open-cast, though the present end is within a few feet of a lode.

2.—To work the side lodes, which, at a good price for copper, had paid as much as 20,000. a year profit.

3.—To test the White Rock and Morfa-dhu lodes, upon which 12600. have now been spent, and 6000. more required.

In the early part of the company's operations the price of copper enabled them for some time to do all this work, and to make a small monthly profit besides, while they are also laying open ground for larger returns and increased profits, but copper suddenly dropped in price, and its disastrous effects, aided by the advance in coal, iron, materials, and labour, upon the finances of the company will be best shown by the following comparison of prices:—

In 1870 the price of No. 1 ore of the company was 67. 8s. per ton, and it dropped to 37. 8s. per ton.

No. 2 brought 27. 9s. per ton, and dropped to 13s. 6d. per ton.

Precipitate, 137. 6s. 6d. per ton, and dropped to 47. 14s. per ton.

The total costs expended on the mines since July, 1870, exclusive of the extensive machinery and plant by the company, have been £36,087 3 1

Royalty paid to the Marquis of Anglesea and Lady Dinorben 2,410 14 3

Total £38,497 17 4

The returns have been:—

No. 1 copper ore 3987 tons 9 cwt. £17,835 4 11

No. 2 copper ore 1483 " 4 " 5,905 4 11

Sulphur 434 " 2 " 431 8 3

Blue-stone 225 " 0 " 225 0 0

Precipitate 509 " 19 " 4,084 12 7

Ochre 3298 " 3 " 3,465 5 6 = 32,006 15 7

Showing a loss of £ 6,491 1 9

The fall in copper has been equal on No. 1 to 27. 19s. per ton; No. 2, 17. 15s. 6d. per ton; precipitate, 87. 12s. 6d. But taking the mean at 27. 16s. and 87s., the following results are arrived at:—

No. 1..... 3987 tons, depreciation 27. per ton £ 7,974 0 0

No. 2..... 1483 " " 17. 15s. per ton 5,504 0 0

Precipitate, 509 " " 87s. per ton 4,074 0 0

Depreciation £17,550 0 0

Deduct loss on working 6,491 1 9

Showing profit on sales had the original prices been maintained ... £11,158 18 3

Thus, had the price of copper kept the same as it was when the company commenced operations, there would have been a profit on that head of 11,158. 18s. 3d., and which would have been further increased to upwards of 20,000. had coal, iron, and labour also kept at the old price. Coal has risen from 13s. 6d. to 17. 6s. 11d. per ton; old iron from 17. 15s. to 37. 10s.; and these 225 tons of coals have been used per month, and 70 tons of old iron quarterly. Bar iron has risen 90 per cent., steel and timber 30 per cent., and wages 20 per cent. These, then, are the difficulties with which the directors have had to contend, and in deciding upon the future it should be considered,

1.—That there is a large and valuable plant on the mine.

2.—That coal, old iron, and other materials are daily becoming cheaper.

3.—The reserves of ore opened out by the present company are estimated at the present low price of 60000. At Carreg-y-dol, which has been opened out entirely by this company, there are now stops at work, valued in the aggregate at 42 tons of copper ore and 14 tons of sulphur per fath.

4.—The agents are sanguine that with a fair advance in copper good profits could be made.

And it is a question for the shareholders to decide, whether they will lose the advantages to be reaped from the large outlay already made for the want of a small additional capital.

Capt. T. Mitchell says—"The present returns of copper ore got chiefly from the new ground recently opened on the Carreg-y-dol lode. The lode is about 20 fms. south of the old lodes, and hitherto comparatively little has been done on it; it is a strong, fine-looking lode where seen at the present points of operation, and the more it is developed greater will be the chances for further discoveries. In fact, it may be justly considered as opening out a new mine by the side of the old one. The number of hands employed underground, including the stopping and on tribute, 63; pitmen, skip-filers, wheelers, and trimmers, 10; making together 73 men. And at surface in the various departments, 60 men, boys and girls, making a total of 133 hands."

The CHAIRMAN, in calling attention to the different points in the report, explained that the mine had been one of if not the richest copper mines in England, and that even at the present moment the want was not so much that of copper ore, of which in reality there was plenty in the mine, but of a better price for it. At present the returns were very nearly meeting cost, but a rise of 15s. per ton on the ore would give a good profit. Then, the points of interest, either of which might become of vast importance, were the 90 cross-cut south, towards the open-cast, the Morfa Dhu, and the blue-stone. And it rested with the shareholders to say whether, with all these good prospects before them, they would lose the mine or raise a little further capital to carry it on to a successful issue. He wished every

shareholder would do as he had done, go and visit the mine for himself, and he would then be satisfied with the value of the property, in which he had himself invested nearly 50000.

Capt. MITCHELL, the agent of the mine, was present, and stated that the ordinary ore of the Carreg-y-dol lode was of a low quality, but lately in the stopes in the back of the 80 a rich bunch had come in, and was still improving; the ore here was equal to 10 per cent. produce. He also explained that last year he valued the reserves on this lode at 50000., and although since that time 50000. worth had been sold the reserves were now, even at the present low price of copper, worth 60000. To get under the great open-cast in the 90 would take nearly two years, but between the present end and that point there were three well-known productive lodes to be intersected, and one of these he hoped to meet with in two or three months. He also explained that the discovery at the 80, at Carreg-y-dol, was whole to surface; that it would soon be met with in the 45, and cross-cuts could soon be put out at the 30 and the 18 fm. levels.

It was eventually agreed unanimously that the directors call a special meeting, to do away with the authority given twelve months ago to issue 6000 shares at 2½ dis.; and to authorise the issue of 5000 shares of 1½ each, to be issued *pro rata* to present holders, with a preferential dividend of 15 per cent.

A vote of thanks to the Chairman terminated the proceedings.

EAST BLACK CRAIG MINING COMPANY.

The annual general meeting of shareholders was held at the company's offices, Liverpool, on Monday, Mr. R. DUKE in the chair.

The SECRETARY read the notice convening the meeting, and the balance-sheet, showing—cash available, 1247. 8s. 11d., and outstanding debts, 1947. 15s. 5d., to meet sundry creditors, 6697. 7s. 7d., was submitted.

The directors reported that they were convinced that the mine was a good one, but that the working was far from efficient. In July they engaged Captain T. Richards, of Redruth, to inspect and report upon the mine. He reported that he had formed an excellent opinion of the mine, judging from the appearances and discoveries made that it seemed to be the leading mineral vein of the district. He advised various alterations, such as putting the shaft into good order, the erection of a 35 in. cylinder engine for the purpose, and it was resolved that the present engine, the extension of the washing floors, &c. After considering the report, conferring with the agents and others, the directors resolved to carry same out so far as practicable. Arrangements have been entered into for the purchase of a second-hand engine which was lying near the mine, and with a competent engineer to erect the same; a substantial stone engine house has also been erected, part of the engine is now fixed in the house, and arrangements are in progress so as to have the dressing floors enlarged by the time the engine can start working. The directors fear that will not take place until early in April, but the shareholders may rely that no time shall be lost in hastening on the work.

The agents, Capt. R. Gough and John Betty, continue to report most favourably of the mine, and estimate the reserves in sight at 20,000. It is, however, impossible with the present engine power, &c., to increase the returns beyond the average of 21 tons per month. When the new engine and floors are at work it is expected the returns will be more than doubled. It is undoubted that important discoveries are being made as they continue driving, and the agents estimate that when another level can be sunk below the 108 fm. level (in about four months after starting of engine) still further valuable discoveries will be made. They value the ore in the next lift at upwards of 10,000. It is apparent that there is a great body of lead in the mine, which only requires getting out.

Messrs. Leman and Asher were re-elected directors; Mr. Gittins was elected auditor, and Mr. Gittins was re-elected. It was resolved that a sum of 3750. be allowed to the directors as remuneration for the two years ending Dec. 31, 1874, such remuneration not to be paid until after a dividend of 10 per cent. be declared. The meeting declined to accept the draft lease from Captain Heron of the water from his estate, or of his mineral property adjoining East Black Craig, for a term of 19 years, but requested the directors to obtain a lease thereof, providing same can be obtained upon what they may consider fair and reasonable terms, the amended draft lease to be first submitted to an extraordinary general meeting of the shareholders.

SOUTH WHEEL FRANCES MINING COMPANY.

A special general meeting of shareholders was held at the account-house on Monday, Mr. JOHN F. PENROSE in the chair.

The accounts of the mine for the three months ending December, showing a balance against the adventurers of 1077. 9s. 3d., were passed and allowed. To meet this adverse balance, and an instalment payable to the West Frances adventurers of 4377. 10s., it was determined to make a call of 3s. per share, which was unanimously agreed upon.—Capt. JAMES submitted the following report:—

Pascos's shaft is now about 13 fathoms below the 154, in which we have fixed an 8 in. drawing lift. The water being very light can be drawn out by working the flat-rods about two hours in 21. The skip-rope is brought down, and is now complete to the 160; nine men are engaged in cutting plat, and in making the necessary preparations for sinking the shaft below this level as quickly as possible; at this point the lode is small, and not rich enough to value, but in cutting the said plat we expect to intersect the south part, which we hope will be more productive. The 154 winze, about 10 fathoms east of shaft, is being sunk by four men, at 67. per fathom; the lode is producing a little tin, and presents a kindly appearance; this winze is being sunk for ventilation. The 144 shaft, about 20 fathoms east of shaft, is worth about 50. per fathom; stopping by two men and one boy, at 42s. 6d. per ton. The 124 stopes, on the north lode, west of shaft, is worth 77. per fathom; stopping by four men and two boys, at 42s. 6d. The 124 cross cut is being driven south by six men, at 177. per fathom; this cross cut is now 7 fms. south of north lode, and we are daily expected to intersect the south lode. The 104 stopes, just immediately above the above cross-cut, is worth 207. per fm., and is being stopped by 10 men, at 44. 8d. per ton; the lode shows no signs of declining in strength or value, and judging from its present appearance we hope to cut it rich in the cross-cut, which is about 12 fathoms below this point. The 15 winze, west of shaft, is worth 67. per fathom; sinking by four men, at 177. per fathom; we expect to communicate this winze with the 144 on or before the end of this month. The 104 stopes, west of shaft, is worth 87. per fathom; stopping by four men and one boy, at 35s. The 94 stopes, west of shaft, is worth 57. per fathom; stopping by two men and two boys, at 20s. —Marriott's Engine Shaft: Since the last meeting the 154 has been cleared from this to Pascos's shaft, and two men are now employed in laying down a new tramroad, which will be completed about the end of this week. The stopes in the back of this level is worth 57. per fathom; stopping by four men, at 65. per ton; here we expect to employ more men in stopping shortly. The 144 cross cut is being driven south on Marriott's floor by two men and two boys, at 57. per fathom; the rock is still favourable for progress, and judging from the increased quantity of water issuing from the end seems to indicate the lode is not far off. —Richard's Shaft: In consequence of the low price of tin and copper, and the unusually high prices of coals, timber, and iron, all network operations in this part of the mine are for the present suspended. The flat-rods at the 104, from Marriott's to the bottom of Pascos's shaft, is now complete, and they work admirably; the placing of these rods through a very crooked level, and an equally crooked shaft, has been a great source of extra cost in labour and materials, as the merchants' bills presented to day, which are unusually high, too plainly indicate. But now this task has been performed, and a very fair supply of pumps and other necessary materials on the mine in case they should be wanted. Every effort will be now made in confining operations to developing the chief points of the mine, and in reducing the cost to its utmost minimum. We still consider the great point of the mine to be the intersection of the West Russet great tin lode in depth; but we also consider the 124 cross cut a very important point now on the eve of being developed, if found rich, two cross-cuts, one at the 134, and another at the 144, will be started almost immediately.

The next business of the meeting was to consider the question of forfeiture of shares for non-payment of calls.

The CHAIRMAN explained to the meeting that two shareholders had intimated to him by letter that, although willing to pay their proportion of the working expenses, they refused to respond to his demand for any portion of the calls made, and to be made, for the purpose of liquidating the sum agreed to be paid for ores taken away from the West Frances Mine by the late executive.

A SHAREHOLDER stated that he had also communicated with one of the shareholders who had declined to remit the call made upon him, and said that he had pointed out to him that the large interest he represented had paid their share without prejudice to any action that may be taken hereafter in respect to money paid for *litches* committed by other persons, and he hoped that he would do the same.

After some discussion it was ultimately decided that the question of forfeiture of shares should be deferred till the next general meeting.

Mr. LAWS said: You will remember that at the last general meeting, on behalf of a large interest that I represented at that meeting, I asked you to consider the appointment of an office of reference in London, but there appeared to be some opposition to the movement at the time, and the only arrangement made was that I was to be furnished with a monthly report and the amount of the monthly cost. This has been duly attended to by my pursuer, but as my friends consider they are entitled to further information, I am again requested to bring this matter before you. I am aware that to copy out the cost-sheet, which is a voluminous document, would necessitate some extra labour on the part of my pursuer, but there are many charges that may be considerably condensed, such as dressing costs, monthly and day labour, &c., which might be stated in a few lines. My impression is that you think I am agitating for an office in London for the sake of profit; it is not so, as I have no wish to burden the mine with any extra expenditure; at the same time, should the mine be successful by-and-by, perhaps you might be asked to consider the question of remuneration for any services that might be rendered. We certainly think we are entitled to what we ask as being reasonable, not that there is the least want of confidence in the manager or agents, as I believe that everything is being done that can be done for our interest and benefit. At the same time it would be a satisfaction to shareholders in town if their wishes were complied with, and I believe myself that if you concede what I ask it will have a good tendency to ally more closely the local and London interests—an alliance, I need not say, much to be desired. That you may not think that I am acting entirely in my own interest I suggested to a gentleman in London, one of the largest shareholders, I should add at the instigation of my pursuer, that he should accompany me to the mine and attend this meeting, and I will now read to you his reply, which I received a day or so before leaving London, in which he clearly states his wish that our office should be opened in town for the use of adventurers in and near the City. I will now leave the matter in your hands, and I hope I may be able to satisfy my friends on my return that there is a disposition on your part at least to meet us half-way in any reasonable proposition that may emanate from us for the good and benefit of the mine.

Mr. NICHOLL said he considered Mr. Laws's proposal a fair and reasonable one, and would second any resolution that he might submit, the shareholders having concurred in the arrangement.

The CHAIRMAN said he agreed with Mr. Nicholl, as Mr. Laws was the representative of a large interest that I represented at that meeting, I asked you to consider the appointment of an office of reference in London, but there appeared to be some opposition to the movement at the time, and the only arrangement made was that I was to be furnished with a monthly report and the amount of the monthly cost. This has been duly attended to by my pursuer, but as my friends consider they are entitled to further information, I am again requested to bring this matter before you. I am aware that to copy out the cost-sheet, which is a voluminous document, would necessitate some extra labour on the part of my pursuer, but there are many charges that may be considerably condensed, such as dressing costs, monthly and day labour, &c., which might be stated in a few lines. My impression is that you think I am agitating for an office in London for the sake of profit; it is not so, as I have no wish to burden the mine with any extra expenditure; at the same time, should the mine be successful by-and-by, perhaps you might be asked to consider the question of remuneration for any services that might be rendered. We certainly think we are entitled to what we ask as being reasonable, not that there is the least want of confidence in the manager or agents, as I believe that everything is being done that can be done for our interest and benefit. At the same time it would be a satisfaction to shareholders in town if their wishes were complied with, and I believe myself that if you concede what I ask it will have a good tendency to ally more closely the local and London interests—an alliance, I need not say, much to be desired. That you may not think that I am acting entirely in my own interest I suggested to a gentleman in London, one of the largest shareholders, I should add at the instigation of my pursuer, that he should accompany me to the mine and attend this meeting, and I will now read to you his reply, which I received a day or so before leaving London, in which he clearly states his wish that our office should be opened in town for the use of adventurers in and near the City. I will now leave the matter in your hands, and I hope I may be able to satisfy my friends on my return that there is a disposition on your part at least to meet us half-way in any reasonable proposition that may emanate from us for the good and benefit of the mine.

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of a very large interest in the mine, and it was at length resolved—"That an office of reference be opened in London for the receipt of any information that might be required by shareholders in and near that City," and it was understood that the office was to be held clear of any expenses against the mine.

Mr. LAWS thanked the shareholders for kindly considering his request, and said he hoped that our connection may be for many years, and that we may be rewarded by a successful mine.

The CHAIRMAN observed that he believed they had now arrived at the turning point of the mine, and he trusted that very soon they would be in a position to pay their costs without drawing upon the adventurers. They had a very good lode at the bottom of the 104, and this they hoped to cut under the most favourable circumstances. Although it had been his misfortune to have to make a call every meeting since he had been in office, he believed they would have no reason to despair.

Capt. JAMES said the prospects of South Frances were certainly very good, and the fact that the agents had to ask the adventurers to still contribute to its working was not very agreeable, but they might depend that the mine was managed by them just the same as if the property was their own. There was a wonderful difference between working a mine to stop, and working a mine to pay, and it was upon the latter principle that South Wheel Frances was being worked. Their flat-rods were acting admirably, and since they had been using them they had not suffered a single breakage. The great point of South Frances was now before them, and by perseverance he believed they would succeed at last; indeed, he felt confident that the mine would present a different appearance six months hence from what it did now. They were making every effort to get the mine down as quick as possible, and up to the present time they had sunk 14 fathoms without the aid of machinery, a fact which spoke very favourably for the bottom of the mine, and he did not expect they would have much water to contend with. He prophesied a speedy return to more prosperous days.

A vote of thanks to the Chairman terminated the proceedings, and a pleasant meeting was dissolved.

CARN BREA MINING COMPANY.

The quarterly meeting of adventurers was held at the mine on Wednesday. The accounts to end of September showed:—Labour costs for three months, 5912. 2s. 3d.; merchants' bills, 3639. 0s. 6d.; carriage, 330. 7s.; dues, 463. 16s. 6d.; Vice-Warden's assessment, 10. 13s. 3d.; doctor's pence, 30. 10s.; rates, 104. 1s. 3d. = 10,493. 12s. 2d. The credit side showed:—Tin sold, realising 9974. 11s. 9d.; copper, 1126. 13s. 7d.; arsenic, 71. 10s.; extra carriage of black tin, 52. 19s. 3d.; total, 11,255. 14s. 7d., showing a profit on the three months' working of 732. 2s. 5d., which added to the balance standing in favour of the adventurers at the last meeting left 6223. 4s. in hand.

The following are the principal points in the agent's report:—

Highburrow Lode: In the 238, driving east of cross-course winze, the lode is much improved since we have opened on it; a very kindly lode, and worth for tin 207. per fathom, and we think it will shortly further improve. In the 238 driving west of winze, the lode is large, but we are not out of the influence of the cross cut course, nor shall we be for a fathom or two driving, but as soon as the lode becomes settled we have no doubt but that it will become productive. In the 236, driving east of the cross-course winze, the lode in the last 2 fathoms driving has much improved in appearance, and is now worth for tin about 107. per fathom, and we anticipate another improvement shortly. In the 228, driving west of cross-course winze, the lode is worth for tin 207. per fathom. In the winze sinking under the 228 we have a lode worth 1207. per fathom. The winze is about 20 fms. east of the 236, which shows every probability of opening up a good run of tin ground. In Highburrow shaft, sinking under the 213, the lode is not so good as when last reported, being now worth about 257. per fathom for tin. In

Lectures at the Royal School of Mines.

ON METALS.

Dr. PERCY, in his third lecture, dwelt chiefly on the subject of "COPPER SMELTING." In introducing the subject he said—I have been asked to say a word or two on the subject of corrosion of iron in contact with lead. You must have observed the iron railings of London. Where the iron is in immediate contact with the lead at the bottom, there corrosion takes place to the greatest extent. When two metals are brought together—say, zinc and copper—they rust on exposure to air and moisture, but one of them serves to protect the other from rusting. To prevent the corrosion of the copper on ship bottoms, Sir Humphry Davy recommended that pieces of zinc should be placed in contact with the copper; by that means the corrosion of the copper was prevented, but the zinc corroded and wasted very rapidly. Since that time the Admiralty have had some more precise experiments made on this subject, and it has been found that when in contact lead promotes the corrosion of copper, and copper promotes the corrosion of iron.

Now, coming to our proper subject, let me say a word or two about some so-called alloys of copper. What takes place when copper and lead are melted together, or mixed together (say) at temperature of melting point of copper? Will they alloy—that is, remain permanently united when the metal has become cold, as in the case of common brass, a compound of spelter and copper? Suppose I take a quantity of copper and melt it, and add thereto an equal weight of lead, and mix the whole together thoroughly; then if I take out the mixture and cool it rapidly I get an ingot composed of copper and lead, almost wholly in mechanical mixture? Suppose instead of cooling it rapidly I leave it to cool slowly; an almost complete separation of the two metals takes place, the lead being the heaviest of the two accumulates at the bottom of the mould. The separation in this latter case is not perfect, for the copper will retain about 2 per cent. of lead, and the lead also about that percentage of copper. There is, therefore, no proper alloy of these metals in the strict sense of the term.

Next, let us take copper and iron, and the iron we use will be that which is most like pure iron—wrought-iron. Suppose we expose the mixture of copper and iron to a very high temperature, we shall not get anything but a mechanical mixture, and when the proportion of the iron increases beyond a certain degree we can distinguish under the microscope small grains of that metal diffused through the mass. Iron is a white metal, and copper a red one. In every other case that I know when two metals differing in colour form a true alloy the product differs in colour from either of the metals; but in the case of this mixture of iron and copper the product is a ruddy-coloured mixture like copper, the iron being diffused through it. That is to mind a satisfactory proof that it is a mechanical mixture, and not a true alloy. To get this mixture in the best manner take some oxide of iron and oxide of copper as fine as possible, and mix them up intimately with some finely-powdered charcoal, and then subject the mass to a high temperature; the charcoal, as we know, will then reduce both the oxides, and set free the metals in a condition most favourable for their combination. I shall have more to say of the alloys of copper subsequently; we now turn to the smelting of copper.

In the first place, let me call attention to the ores of copper; and, first in order, will come metallic copper or native copper—*i.e.*, where it occurs in nature in the metallic condition. It is frequently found in this state in connection with other copper ores; sometimes in vast masses, as near Lake Superior, where it was said there was one mass of copper in the metallic state weighing not less than 500 tons. In this condition it is, perhaps, one of the most expensive ores of copper, for the metal is excessively tough, and cannot be blasted, but must be prepared for the market by being cut up with tools. The next ore is the oxide of copper; there are really two oxides of copper, the red and the black, and they are amongst the richest ores of copper. Then we have the blue and green carbonate; the latter is commonly called "malachite," and is frequently applied to ornamental purposes. These latter ores are compounded of oxide of copper, carbonic acid, and water, and when heated up to a good red heat they lose water and carbonic acid, and the residue consists of oxide of copper. In treating an ore of this kind, then, we may consider ourselves, therefore, as virtually treating an oxide of copper. There is another class of ores in which copper is combined with sulphur; one exactly similar in all respects to that compound I have before described—the grey sulphide of copper, an extremely valuable ore. Then there is another in which iron occurs as a constituent—common yellow ore or copper pyrites; it consists of copper and iron, and sulphur. Sometimes copper pyrites is mistaken by inexperienced persons for iron pyrites, a compound of iron and sulphur, which is far less valuable than the other, but here is a simple test by which you can infallibly distinguish between them. Apply the point of a pen-knife in the case of copper pyrites; you can scratch it easily, but in the case of iron pyrites you can make no mark upon it.

Let us now proceed to explain the mode in which copper is extracted from its ores on a large scale. We will suppose that the problem is to extract copper from copper pyrites or yellow copper ore. When the ore is perfectly pure it contains in round numbers 34 per cent. of copper. Let us suppose our sample of ore to contain 8 or 10 per cent. We can extract our copper simply, effectually, and economically by means of heat and atmospheric air, with the addition, however, of one more agent—silica. Given these things, silica (and it is frequently found associated with many copper ores), copper pyrites, and atmospheric air, and we shall be able to extract the whole of the copper. In the first place (process 1, Calcination), we shall proceed to heat it several tons at a time in a large calcining furnace, allowing the air to have free access. Some of these furnaces are as much as 20 ft. long. They are of the kind known as reverberatory furnaces, that term meaning beating down or beating back, such furnaces being largely employed in metallurgical operations. In such a furnace there are three essential parts—the fire-place at one end; the bed of the furnace, upon which the material to be heated is spread, separated from the fire-place by the fire-bridge; the third essential being the stack or chimney at the end opposite to the fire-place. In copper works this furnace is called the "calciner," because in it the ore is calcined. The bed is quite flat, and rounded at each angle; in it there are six square poles, three on each side, corresponding respectively to three doors on each side; during the operation these doors are kept closed by means of fire-bricks. When the operation is completed the doors are opened, and the material raked out into vaults underneath. The furnace is closed in at the top by means of a long and low roof extending from the fire-place to the stack. The stack is built independently, but connected with the furnace by means of a short flue. The material to be introduced into the furnace is dropped in from a large hopper connected with two openings leading into the interior of the furnace. In the calcining furnace, as we require but a comparatively low temperature, the fire-grate is small compared with what it is in the other furnaces employed in subsequent stages of the process; these latter in their general conditions resemble the one just described. The material employed for constructing the furnaces is fire-brick, at all events in the hottest parts of them. The fire-brick is of two kinds, the one made of ordinary fire-clay, the other of silica or quartz broken up coarsely, and then mixed with a small quantity of lime, and exposed to a strong heat; the lime acts as a cement, and binds together the grains of quartz. The second kind are very difficult of fusion, and have one property which distinguishes them from fire-brick made of ordinary fire-clay—that whereas the latter contract, when strongly heated, the siliceous bricks expand, and are hence well adapted for the hearths of furnaces. With regard to the fuel, many of the large copper smelters work their own collieries, and in that case they sell the best of their coal, and keep the worst or the least saleable—notably, "slack" or "dust"—for the furnaces. The manner in which they utilise this ash and small coal is as follows:—They allow the ash to accumulate sometimes to a great depth, perhaps a foot or more upon the bars; being somewhat softened at a high temperature it binds together and forms a "clinker," on the top they burn their coal, and every now and then they break up the clinker ("breaking the grate") to let the air pass through, and as

the ash accumulates at the top they remove the lower part of the clinker. An air channel runs right through the wall between the fire and furnace, so that the air may circulate through and keep down the temperature of that part. Three openings in this channel connect the passage with the furnace. Now, we take our ore from 3 to 8 or 10 tons, according to the size of our furnace. Remember the other ingredients besides the copper are silica, iron, and sulphur, and the agents we have to work with are heat and atmospheric air; it is the oxygen of the air which is the essential agent. We spread the ore uniformly over the bed, and stir it up from time to time to expose fresh surfaces of the air, and keep it thus for several hours, 12 or more, according to the nature of the ore. When the ore is thus heated in free contact with the air, the sulphur in great measure burns off, and escapes in the form of sulphurous acid. For every portion of the sulphur thus displaced the metal takes up an equivalent of oxygen. Our object in this case is not to expel as much sulphur as possible, but we leave purposely in the ore a certain amount unchanged in this process.

2.—The next process is melting, or fusion. For this we require a higher temperature, and, therefore, a furnace with larger fire-place, but it is again a reverberatory furnace. There is one opening in the roof to charge the furnace; a long arch runs under the furnace from end to end; the bridge contains a channel through which the air can circulate freely to keep it cool, and this part of the structure is supported by a large iron plate—the bridge plate. The bed is not made of fire-brick but of sand, of particular kinds of sand; sand blown near the sea from the neighbourhood of Swansea is well suited for this. The floor of the furnace is quite flat, of brickwork, and sand is thrown on to the depth of about a foot, and fashioned so as to have a cavity on one side to which the bed slopes uniformly, so that the melted ore may run down into it, and be "tapped" out. To consolidate the sand we take some silica, or better, a slag consisting of silica and oxide of iron—"tap cinder." This silica, which is very fusible, is broken up and spread uniformly over the sand. A strong heat is then applied, and as the slag melts over the surface it becomes more or less solid; more sand is then put in, and then more slag, and fashioned as at first, and so on to the necessary depth, and in that way the furnace bed is prepared. Formerly they used to build these furnaces without an arch underneath, and much of the copper used to penetrate into this bed; in one furnace as much as 60 tons of metallic copper have been extracted from the bed at one time. So much for the furnace. Now we will take some of the stuff resulting from the previous calcination process—say, 25 cwt.—and put it into one of these melting furnaces through the hole in the roof; there is also a hole at one end for stoking, and another near the stack for various operations. We will add at the same time a certain quantity of slag produced in a subsequent part of the process; it is a compound of silica and oxide of iron, and, perhaps, about 2 per cent. of copper; the latter constituent is extracted in this process. We next have to get up a strong heat, and in about five hours the whole should have melted down completely, being stirred up from time to time with long iron rods. There will now be in the furnace two distinct layers, the lower and heavier one consisting of copper, iron, and sulphur—"metal"—and the upper one consisting of slag, the two layers having no tendency whatever to combine. An experienced workman knows when this process is complete, and then a long-handled iron rake is inserted, and the slag is skimmed off as completely as possible. The furnace bottom is not full, and so another charge may be put in before the metal is taken out. When that is finished the tap-hole is opened, and the red-hot metal run out into a pot or tank in front containing water, and by this means the metal is broken up into small round fragments, which are collected in a sieve suspended in the water, and can be drawn up by means of a crane. Formerly the metal was cast into cakes, and then broken up into small pieces by means of the water; this labour is avoided. Now we have a compound containing as much as 34 per cent. of copper, so that we have made some progress in our work. We have also got rid of the silica which has combined with iron, and has left a compound of iron, copper, and sulphur.

You will remember that I have mentioned that if you take certain proportions of oxide of copper and sulphide of copper, and heat them together, the sulphur burns off and metallic copper is left. Suppose in the process of calcination we could so adjust the sulphur and oxygen in this proportion, then by means of a high temperature we should get out metallic copper. But here we have a case not merely of sulphur and copper, but in addition to these we have iron. Now, silica has a strong affinity for oxide of copper, but it cannot exert that affinity when iron is present.

3.—CALCINATION. The next step is to take a quantity of the coarse metal from the last operation of fusion, and calcine it so as to remove a portion of its sulphur, and leaving in its place an equivalent of oxygen. Now, then, we have a mixture of unchanged "metal" and oxide of copper and oxide of iron.

4.—Then this is heated again with the addition of matters rich in oxide of copper, such matters as the slag formed in the two remaining processes, and also some ores of oxide of copper. By raising the temperature to a high degree we get that reaction between the oxide and sulphide of copper, and as there is silica present in the slags we get "fine" metal of much the same percentage composition as that produced by burning sulphide of copper and oxide of copper—about 70 per cent.—and the whole, or nearly the whole, of the iron will have been separated with the silica as slag. The metal is then tapped into sand moulds.

5.—Next, several tons of this metal are taken and thrown into a reverberatory furnace made with an opening on each side of the fire-bridge, so as to let in a greater quantity of air. If you stand by this furnace you first hear a strong "frizzling" sound—it is the sulphur burning off. At length we succeed in turning out the sulphur, and obtain the copper in the metallic state, containing a certain proportion of iron and sulphur, and wholly unfit for useful purposes—it is known as "blister copper."

6.—The last process is the refining process; 8 or 10 tons are put into a furnace which slopes to one end, and heated very strongly, with free access of air. The copper becomes converted into oxide of copper, the iron into oxide of iron, and nearly all the sulphur burns off. The copper is then reduced by charcoal, and by the help of the process of "poling," as described in the preceding lecture.

NORTH STAFFORDSHIRE MINING INSTITUTE.

The annual meeting of the North Staffordshire Mining and Mechanical Engineers was held at Stoke-on-Trent, on Monday last, Mr. Macdonald, one of the vice-presidents in the chair. About seventy members were present. Mr. J. R. Haines, secretary, presented the report of the Council, which was of a most satisfactory character, showing that, although the Institute had been established only a little more than a year there were already 113 members elected, including eight honorary members. He explained that since the accounts were made up 65*l.* had been received, so that there was nearly 100*l.* in hand. The report and auditors' statement of accounts were adopted. Five new members were elected, and seventeen were nominated for election at the next meeting.

Mr. Woodworth, of Longton, read a paper on "The Economical Application of Steam-Power to the Drainage of Mines, and Raising of Minerals therefrom." He gave an interesting account of the improvements made from time to time in steam-engines, and his own opinions of the relative advantages of the different descriptions of pumping and winding machinery. It was ordered that Mr. Woodworth's paper should be printed for the use of the members.

Mr. C. J. Homer was appointed president of the Institute for the ensuing year, and the other officers having been chosen, the president promised a paper showing the extent and value of the North Staffordshire coal field. Various articles of interest were exhibited, amongst them being a patent apparatus by Mr. Siddons, of Hill Top, West Bromwich, for the prevention of overwinding. It was regarded as an excellent invention. Mr. Applegarth, of London, conducted some experiments with the Aërophore, the object of which invention is to enable persons to enter a mine after an explosion, and before the ventilation is restored. Messrs. Homer and Thompson experimented with dynamite shots, which are used in the Whitfield Colliery for blasting purposes. A 3-in. plate had a piece blown out

of it, and a large piece of cast-iron was shivered into pieces. The annual dinner in connection with the Institute was held in the evening at the North Staffordshire Hotel, Stoke, and was largely attended. Mr. Homer was chairman, and Mr. Wilkinson the vice-chairman. During the evening several speakers dilated upon the advantages of the Institute.

THE ECONOMIC CONSUMPTION OF FUEL.

The Exhibition of Appliances for the Economic Consumption of Fuel was formally opened on Jan. 30, the ceremony being conducted in the presence of the exhibitors and a large number of visitors. Mr. I. Lowthian Bell, one of the vice-presidents of the Society for the Promotion of Scientific Industry, had been announced to open the exhibition, but was unable to fulfil his engagement in consequence of his candidature for the representation of North Durham. In his absence the ceremony was performed by Mr. Hugh Mason, Chairman of the Council. Mr. Bell, however, sent a written address, which was read by Mr. Larkins, the secretary. In the course of the address Mr. Bell said it was needless to remind the meeting that whatever might be the condition in respect to civilisation of a nation, wood in the first ages of its history was the only fuel made use of. It was consistent with actual experience that perfectly civilised nations could not only exist, but flourish in various industrial enterprises, and yet be entirely dependent for the fuel they required on the forests which still more or less covered the face of their respective countries. But, however practicable this might be in countries where the soil was incapable of being put to other uses, it might be dismissed at once from one like our own. Indeed, it may be safely said that no people could long carry on large manufacturing operations where forests were to be the sole sources of the fuel required. The liability of our coal fields to exhaustion had, therefore, very properly conferred upon the question of fuel supply in this country a great and increasing importance; but although coal had risen to a price which nothing short of a prevailing and permanent famine could justify, he firmly believed that there was a more salutary way for this apprehension. At the same time, he was very far from thinking, looking even at a future of no remote distance, that very cheap coal was an unmixed benefit, because under such circumstances there was no inducement to introduce means and appliances for its economy. Although a very great deal up to the present time had been done to reduce the waste of fuel, he feared that much more remained to be accomplished, and, therefore, it would be difficult to conceive a more appropriate start for a society established for the promotion of scientific industry than an exhibition of appliances for the economical consumption of coal. Amongst the latest scientific discoveries was that which enabled an engineer to state correctly the maximum moving force evolved by burning 1 lb. of coal. Should it be said, then, that they who consumed coal, who were making broads, saw it was true, but sure, into the stock of a material upon which such knowledge as to that which he had alluded to ready for its proper application. To that enquiry he trusted the labours of the Council of the Society for the Promotion of Scientific Industry would afford the assurance of a direct negative. Mr. Mason then declared the Exhibition opened, and the proceedings concluded.

The Exhibition (which was fully referred to in last week's Journal) is now in fair working order, and with one or two exceptions, where the exhibits have not yet arrived, the whole of the machinery, &c., has been finally arranged and placed in position. In many instances the appliances are to be seen in action, and the visitor has thus a fair opportunity of judging as to their comparative efficiency in effecting the most economical use of fuel. It has been very truly said that "it is the British household, the most stupid, improvident, and unenterprising of beings," who is the great offender in the matter of the wasteful consumption of coal, and if the exhibition can but assist in effecting a reformation of this serious defect in our domestic life it will have served a great and beneficial purpose. For such a result there are good grounds for hope, for the section devoted to "domestic and other fires for cooking and for warming rooms and buildings" is exceedingly well represented, including 100, or nearly one-third of the total number of catalogued exhibits. This is a satisfactory indication that inventive skill in this direction has received a very considerable stimulus from the exceptionally high price of coal, and the efforts to effect a more economic consumption appear to be attended with very successful results. Great attention has been paid to the utilisation of the hitherto wasted heat, and in combination with this secure better ventilation and increased comfort for our dwelling-houses. In the matter of kitchen ranges and other stoves very considerable improvement has been made, and the application of gas to cooking and warming purposes would seem almost to have been carried to perfection. It would be useless to attempt even an enumeration of the various exhibits in the above class, so that we must confine ourselves to the leading feature of a few of the most striking. "The Vacuum Draught," a patent by T. and T. Wolstencroft is an admirable, and at the same time simple, contrivance. It consists of a grate, the front of the grate is continued downwards, and means an air chamber is formed underneath, to which air is communicated from within or without the building, bringing the draught under and directly through the bars. In addition to a more perfect and, consequently, more economic consumption of coal, and the obviating of drafts from windows and door, the invention is applicable to important sanitary purposes, for by bringing the draught of the house in direct communication with the fire by a pipe leading to the air chamber beneath the grate, all offensive gases arising therefrom are effectually destroyed by combustion. Indeed, this principle has been carried out in a more extensive scale by Mr. H. Stott, of Halifax, who, in another portion of the building exhibits means of ventilating the sewers and drains of large buildings, and of removing and destroying the noxious gases thereby by causing them to pass through fire. The utilisation of the waste heat of domestic fires is a matter which has been dealt with by different inventors, but the leading principle in all is nearly the same. Behind the grate air chambers are constructed, from which the heated atmosphere is either conveyed back into the room, or is utilised for warming apartments above, to which it is carried by means of pipes. The principle of economy is carried further by adding a boiler behind the grate for supplying hot water to boilers. There are also numerous contrivances for contracting the size of the grate without diminishing the heat from the fire, and as these admit of very easy application they will, no doubt, secure a large adoption. Fire-bricks moulded into various shapes is made to fill up a large portion of the grate, but in some instances more than this is effected, for by perforating the blocks with holes, and the formation of a chamber behind, a diffused current of air is brought upon the fire from the back, and a more perfect combustion secured.

An excellent smoke-preventing grate is exhibited by Messrs. Young Brothers, of London, which consists of an apparatus for feeding the fire from the bottom, and we may add that the inventors apply the same principle to all kinds of engines and boilers. Briefly described, the principle is that of two gates working upon an axis, and as the smoke or gas passes through the hot coal it is converted into carbonic acid, and thus no smoke arises. There is a numerous collection of stoves, and it is certainly surprising what a large amount of work can be obtained from a comparatively small fire. In several of the exhibits a small fire at the bottom of the range is not only made to heat a large hot hearth, on which can be cooked stews, soups, &c., but also boilers and large ovens, the latter being altogether detached from, and some considerable distance from, the fire. The necessary heat is conveyed to various portions of the range by means of hot air chambers, the supply being regulated or shut off at will from any part by means of dampers, and in one instance the superfluous heated atmosphere is utilised for warmth to the room or other apartments. Gas stoves of every imaginable description are exhibited, for which in the matter of economy and efficiency the inventors claim really marvellous results, and, certainly, both the cooking and warming apparatus of this description are worthy the attention of the visitor.

Perhaps the next most important matter to the general public is a fuel which shall be a fair substitute for coal, and at the same time cheaper in price. So far as this is obtainable the general results, as set forth in the present exhibition, may be considered very satisfactory. Peat, of course, is the great competitor, and the varied, and each in themselves distinct, methods which have been adopted for its manufacture are an indication of the persevering attention which has been paid to the utilisation of the important calorific properties of this natural product. Most prominent amongst the peat manufacturing machinery is that exhibited by Messrs. Clayton, Son, and Howlett, by means of which it is stated from 75 to 100 tons of moist peat is capable of being worked up at the total cost of production of from 3*s.* 6*d.* to 5*s.* per ton. The method adopted is that of first squeezing a great portion of the moisture out of the peat, then reducing the substance to a pulp, after which it is cut into blocks and dried.

The Peat Engineering and Sawage Filtration Company exhibit a model of Dauchell's patent peat condensing machines. The peat is here in its wet state passed into a pug mill, after which it is cut into blocks, and then air-dried, which, by many is considered as really the best process of drying, but it is open to the objection that it is dependent upon the weather. Then, there is Kild's process for carbonising peat, which consists in placing the peat, cut up into blocks, in large chambers or ovens, into which is forced superheated steam and the whole products of combustion from a furnace, and the peat, it is stated, may be dried and charred in less than 48 hours. Turning to the specimens of peat in its manufactured state, we have presented to us fuel of a really excellent character. The blocks in most instances are as hard and as dense as coal, and a case exhibited by the Peat Coal and Charcoal Company contains some really excellent samples. The peat is converted, by a process invented by M. Chatillon de Brughant, into perfect coal—hard, crisp, and highly inflammable, and it is stated smokeless and clean in combustion. In course of manufacture every particle of peat fibre is removed, and thus the water substance is got rid of entirely. The company has erected large works in the Norfolk Fens, and we are informed that a few days ago the Peat Coal was tried at Hampton Court Palace, in the presence of distinguished residents, with the most satisfactory results. There are specimens of the peat coal exhibited artistically carved, as an illustration of the perfect solidity and density to which it can be reduced. Amongst the strictly artificial trials the most interesting to me is, to which we have before alluded, the Patent Phoenix Fuel, which by the admixture of a compound is composed, at the cost of about 10*s.* per ton, from the refuse of coal fuel, which is otherwise thrown away. There is also an artificial fuel made from small coal compounded with a calcareous substance and a solution of silicate. Common coal, shale, tar, and peat are the principal ingredients in a number of other fuels which are exhibited.

Amongst the exhibits in the other classes devoted to securing economy in manu-

facturing operations which are deserving notice we may mention an atmospheric gas-engine, manufactured by Crossley Brothers, of Manchester. This is an engine which, although already adopted to a considerable extent on the Continent, is comparatively new in this country. The working of the engine, which is constructed for 1-horse power, briefly described is as follows:—Gas and air mixed in such proportions as to give a mild explosive compound, are admitted under a piston which slides air-tight in a vertical cylinder open at the top. The compound is ignited, and the explosion drives the piston upwards. The ignited gases having increased in volume lose their heat, the pressure becomes less as the piston rises; when it has got to the top of the cylinder a partial vacuum is formed, and the pressure of the atmosphere makes the piston descend. The work thus done by the atmosphere during the return stroke of the piston yields the driving power, which is transferred to the shaft by suitable mechanism. That smoke is a preventable nuisance is now very clearly proved, but the waste of fuel represented by the non-consumption of smoke has not yet been a matter of sufficient importance in itself to bring about so general a sanitary and at the same time economical improvement in this direction as could be desired. The matter has, however, received very considerable attention in the present exhibition, and a large number of smoke-consuming apparatus are shown, and the model of an invention by R. S. Burkett certainly has the appearance of being very effective. Mr. Burkett, in his smoke-consumer, sets out on the basis that it is essential to convey to the unconsumed carbon or smoke the necessary amount of heated air for perfect combustion, and this he does by means of hollow fire bars connected with an air box forming the bridge or far end of the fire; the heated air meeting the unconsumed smoke is mixed with it in a chamber constructed by fixing a perforated fire-clay screen, and the smoke and flame also, by impinging against the hot screen, completes the mixing, and also ignites the further heated gas, should some unconsumed carbon pass through the screen from the first chamber.

There is a further ingenious contrivance by which it is intercepted and consumed. Mechanical stokers are an appliance to which a considerable amount of attention is now being paid, and their adoption by steamers, if at all general, will have an important effect upon the demand for that class of coal which has hitherto been used for steamship furnaces. By the mechanical stokers common slack can be burned in place of the more expensive round coal, and in some cases it is stated a saving of 20 to 30 per cent. has by this means been effected in the cost of fuel. Amongst the apparatus of this description is a stoker, exhibited by Dillwyn Smith. The fuel is conveyed by a screw working right and left from a large hopper to a couple of fans, by which it is regularly and equally distributed over the fire, the amount of the coal thus supplied being regulated according to requirements or the size of the engine or boiler. Irving's self-acting damper is an admirable contrivance for securing economy, the pressure of the steam being made to regulate the consumption of coal.

ANTIMONY ORES, AND THEIR REDUCTION.

FIG. 1.

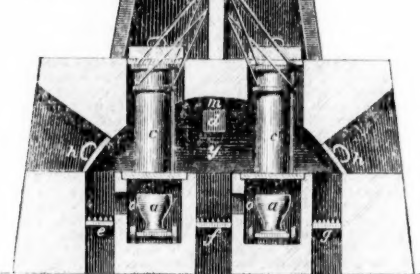
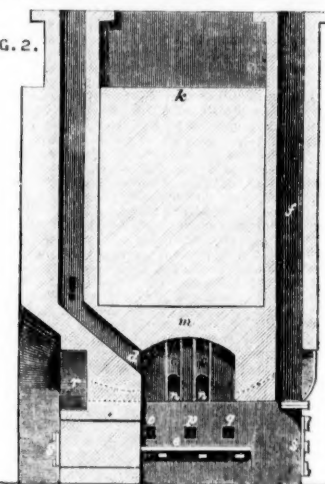


FIG. 2.



Although antimony ores have been found in several places in Nevada, and the reduction of this metal has been tried at different times in that State and in this city, it has not seemed to have been carried on successfully; at all events, operations have been discontinued. The use of antimony is very extensive, its principal value being as an alloy with tin, lead, copper or bismuth for shaft boxes, type, Queen's metal, &c., and also in combination with oxygen, sulphur, and other substances as medicines, of which there are some 10 or 12 different preparations.

The principal ore is gray antimony or sulphuret of antimony, which occurs so often in veins with silver ores in Nevada, Idaho, &c. This ore yields nearly all the antimony of commerce. The mineral sometimes contains \$150 per ton in silver. The white antimony and antimonial blende occur less frequently. The assays of sulphuret of antimony, if made by fire, are not reliable unless melted at a low heat and prepared in the following way:—Five parts of antimony ore are mixed with 10 parts of prussiate of potassa, and covered with two and a half parts of cyanide of potassium. This method of assaying, if the ore is melted at a cherry-red heat, gives 72 per cent. of the antimony, while all the other ways give less.

There are two processes of reducing antimony ores, either by the process of liquefaction or by direct smelting for metallic antimony. The liquefaction is, of course, only practicable with sulphuretted ores. It is a separation of the sulphurets from the gangue by heat, and yields crude antimony, which is used for several technical purposes, but principally to make metallic antimony. This process has in some places the advantage that no flux is required, and it is easily performed near the mine, especially where there is no water to enable them to concentrate.

The process of liquefaction always involves a loss of from 10 to 12 per cent. in antimony, but it is nevertheless practiced in many places in Europe. This process is carried on either in earthen pots or crucibles, or in liquefaction furnaces similar to roasting furnaces. In some parts of Germany and Hungary earthen pots are in use (especially for the richer ores) similar in shape to the French assay crucibles, except that the lower part is somewhat extended, so as to fit in another pot below. The bottom of the crucible is perforated, and the lower pot is surrounded by ashes. It requires a low heat to melt the antimony, which flows into the pot below the crucible. In other instances the pots are placed in furnaces of a very different construction, but always so that a number of the pots, from 12 to 15, are placed in a circle so that one fire may heat them all.

The most practical furnace of this kind for a larger production is that used in France, an engraving of which is shown on this page in vertical sections. The furnace has three fire-places, *e, f, g*, the grate being 4 feet 5 inches long, by 10½ in. wide. The flame enters the chambers, *b*, through several openings, *a, p, q*, and also the space, *y*, and escapes through *d* with the chimney, *l*. Iron

doors, *s*, are placed on both sides. Each chamber, *b*, contains two cast-iron pots, *a*, 12 in. high and 9 in. wide, resting on cars. The chambers are covered with plates, provided with circular hollows for the reception of the earthen cylinders, *c, c*, with a hole in the centre of the hollows, through which the sulphide of antimony flows into the pot, *a*, underneath. The cylinders are over 3 ft. high, and are provided with an opening, *n* (Fig. 2), for the purpose of removing the residue, which openings are closed during the operation. The cylinders go through the arch, *m*, and are shut up by a cover; they, *c*, are charged through the door, *i* (after the furnace has been brought to a light-red heat), with antimony ore the size of a hen's egg, and then covered. The sulphide of antimony soon begins to flow into the receiver, *a*, with a blue colour if the heat has been properly regulated; but if the colour appears red it shows that there is too much heat, and a loss of antimony is the result. The openings, *o, p, q*, are shut up tight as soon as the pots, *a*, appear hot enough. After all the sulphuretted antimony runs out the shutters, *n*, of the cylinders are removed, and the residue drawn out. The pots, *a*, when filled about two-thirds, are replaced by others. The operation continues for about 20 days, and the cylinders are charged every three hours. Each cylinder takes about 490 lbs. of ore at a charge.

Mining and Scientific Press, San Francisco, Jan. 3.

THE COAL AND IRON FIELDS OF VIRGINIA.

An account of his recent visit to the coal and iron fields of Virginia was given by Prof. D. T. ANSTED, M.A., F.R.S., in a highly interesting paper read before the Society of Arts, and fully confirms all that has for some time past been published in the *Mining Journal* concerning the great mineral resources of that State, and the large field which it offers for the profitable employment of capital. The Professor reminded his hearers that about a year ago Major Hotchkiss described the resources of the Virginia States, and the Professor now proposed to supplement the information then given by a record of the results of his own experience, obtained recently during a three months' residence, chiefly among the coal and iron deposits, briefly alluded to by Major Hotchkiss. These deposits, since his address, had been laid open by the completion of the Chesapeake and Ohio Railroad from Richmond, on James river below tide-water, to Huntington, on the Ohio, a point below which there is navigation almost all the year. The development of the mineral resources of the two Virginias was impossible until the completion of railway communication from the Atlantic to the Mississippi. The coal could not be carried to the iron ore, and had no free outlet to the west. It was equally impossible to carry the ore to the coal with any possibility of profit. The James River Canal is still separated from the waters of the Kanawha river by a transit of more than 100 miles, over roads which, even at their best, would not be thought passable in this country. Mineral traffic over such roads was out of the question, and was never attempted.

It is one of the peculiarities of the Virginian mineral fields that the principal minerals are generally accessible above the water level. No borings are needed to prove the presence of the minerals, no shafts required to reach them, no pumping to drain them, and no machinery to open and work them. They are easily and naturally ventilated. The exceptions to this condition are chiefly in the small coal fields near Richmond, the gold districts in and near Buckingham, and the salt in the Kanawha. The magnificent and abundant iron ores, and the boundless wealth of the Appalachian coal fields, are of enormously greater importance than the comparatively small resources of the Richmond coal fields, the gold of Virginia, or the miscellaneous minerals, many of them only rendered useful by the coal and iron. The iron in the east and the coal in the west, then, must be looked on as the principal minerals to which the two States of Virginia and Western Virginia will owe their future importance. The principal deposits of both are crossed nearly at right angles by the line of the Chesapeake and Ohio Railroads. They are thus brought into immediate contact with each other and with the outer world. The iron country of Virginia occupies two distinct geological positions, and the ores are of different kinds. East of the Blue Ridge, which is the easternmost mountain chain of North America, there are bands of magnetite, not absolutely continuous at the surface, but visible and traceable by their contents for a considerable distance, ranging north-east and south-west, and crossed by the rail near Charlottesville, about 100 miles from Richmond. At frequent intervals, within a breadth of about 20 miles, are ridges rising as much as 200 ft. above the valleys, having a core of hard compact iron ore of the finest quality, often yielding much more than 50 per cent. of metallic iron in the furnace. These ores are chiefly peroxide, with a small admixture of protoxide of iron, and very small quantities of silica.

Between Charlottesville and Lynchburg there are ores well adapted for the manufacture of steel by Siemens' process, but capital has not yet enabled the ironmaster to avail himself of this source of wealth. He has little doubt that in a few years steel rails will be manufactured there on a large scale and at great profit by both the Bessemer and Siemens processes. The Blue Ridge forms a natural boundary, beyond which this class of ore does not pass in Virginia. To the west of this chain, however, and in the broad, rich valley that extends in this direction to the Appalachian Mountains, there is a group of Silurian and Devonian rock squeezed into folds, and containing, at intervals for about 50 miles, an important band of brown hematite, and a thinner deposit of rich peroxide of iron. These are repeated in some places three times, and in each repetition contain singularly rich and valuable deposits of ore, the hematites being sometimes more than 40 feet thick, and yielding generally from 40 to 50 per cent. of metal. This great bed is found to extend from Pennsylvania through Eastern Ohio and Virginia to Kentucky. From similar ore, found further north, some of the finest iron of Pennsylvania has been made, but in the northern part of its range the use of it has been checked by the cost of fuel. In Kentucky and Tennessee, however, where these ores have come into use, and in the few parts of Virginia where furnaces had also been erected previous to the opening of the Chesapeake and Ohio Railway, charcoal was the only fuel employed. The splint coal of the Kanawha has now been substituted in these same furnaces for charcoal, without lowering the quality of the iron. The hematite belt commences as you leave the valley of Virginia, a little west of Staunton, and the first deposits of ore of importance come in at a distance of about 10 miles from that town. A considerable number of properties within this belt, and near the rail, have been purchased by Pennsylvania and New York capitalists, some for actual work, others for speculative sales, and in a few years the railway will be lined on both sides with furnaces. In most of these places the ore is quarried, and has a thickness of very many yards. It exists in bluff forming the nucleus of low hills 200 or 250 feet above the general surface and can be obtained with exceeding facility. In many cases limestone bands alternate with the ironstone. At each recurrence of the deposit there are, certainly, millions of tons of ore within a very moderate distance of the railway.

But the iron ore cannot be properly utilised without coal. In Virginia the deposits of coal are not large, and it is certain that to ensure a large make of iron the coals of Western Virginia must be brought to the iron ores of Virginia, or the converse. The cost of conveyance is about the same for coal and ores, and thus, if required, a double business may be carried on with advantage. The most westerly iron ores are about 100 miles from the most easterly coals, but the most easterly coals are not the best, as they consist of beds of only moderate thickness and few in number, underlying the Mahoning sandstone, which is a hard band of gritstone, separating the lower from the middle coal measures. The best coals seem to be the coals of the middle measures. There are, however, good and promising seams of tender coal now being opened at a distance of about 100 miles from the iron ores. The coal, then, is separated from the iron ore in Virginia by a railway distance of 100 miles. Geologically, the distance is greater here than further north, where the lower coal measures are better developed, but where the middle measures are absent. An important fault, removing a considerable thickness of rock, brings the two minerals together. The lower coal measures comprise about five seams, one or two of them as much as 5 ft. thick, generally of tender coal, believed to be well adapted for coking, but hardly yet sufficiently

proved. These measures dip to the north-west, at an angle of about 1 in 100, and are terminated upwards by a hard and thick bed of sandstone, believed to be the Mahoning sandstone of Rogers. It is above this sandstone that we find the noble series of the middle Appalachian coal field, as shown in the Kanawha Valley. Commencing at Mill Creek, near Hawk's Nest station of the Chesapeake and Ohio Railway, we find in Gauley Mountain, which rises behind the station to the west to a height of 2500 ft. above the railway, an unusual thickness of workable and valuable seams. There is here about 60 ft. of workable coal in a number of seams within a thickness of about 800 ft. of measures. One of the lowest workable seams has been lately opened for work, and is found to contain, about 1000 ft. above the railway, at least 10 ft. of hard, compact coal, of the splint and bituminous varieties, and above this are other seams equally valuable. The upper seams include cannel.

From the mouth of the Gauley down the River Kanawha the whole country consists of coal lands for 50 miles. The great plateau is intersected not only by the Kanawha but by many other streams more or less accessible, and is traversed along the Kanawha Valley by the railroad. The coal lands contain for a long distance the whole, or nearly the whole, series, and for a long way almost the whole series is available above the water level. It is not unlikely that some of the coal seams pass occasionally into cannel, and occasionally into iron ore of the blackband variety. Cabin creek, Elk river, and Coal river are three considerable tributaries of the Kanawha, penetrating the country for a long distance, and bringing into convenient working position many scores of thousands of acres of valuable coal land. The two latter are partly navigable, but there cannot be a doubt that before long all of them will be supplied with railroads, by which the coal will be brought into the market. They lay bare some of the finest deposits of cannel coal in America. Near Charleston there is another source of mineral wealth. The manufacture of salt is carried on here, and there is room for many other manufactures of even greater importance. The coal here, as in too many places in and near the Kanawha, comes close to the water level, and the beds are unfractured and nearly horizontal. The quality is also excellent, and the valuable upper seams, which generally include cannel, are close at hand, and may be obtained by very deep mining. The railway crosses this tract for a distance of some miles; the river is here navigable ten months in the year, and the distance from the Ohio is only 50 miles by rail, and is little more by water. The salt manufactured from the brine of the Kanawha valley has been much valued for the curing of meat, and the mother liquor contains large doses of bromides. At present the manufacture is little developed, though of long standing, but no place could be selected better adapted for chemical works, and the site is available for many purposes. Removed at present from existing lines of communication, but likely to be rendered accessible before long, are tens of thousands of acres of valuable land, covered with timber, and abounding in mineral wealth. Large tracts of this kind exchanged hands a few years ago at merely nominal prices, but are already acquiring a sensible value, and few better investments could be made by those willing to leave capital idle for a few years than the purchase of these lands at present prices. At a cost varying from \$3 to \$50 per acre, property may now be acquired that, a few years hence, will be saleable at twenty times that amount.

THE COMMERCIAL FUTURE OF IRELAND.

The highly interesting paper on the Iron Mines of Antrim, by Mr. R. A. Watson, C.E., M.E., has been reprinted from the "Dublin University Magazine" in pamphlet form, and from the vast abundance of really useful information which it contains it should be attentively read by all who are desirous of promoting the material progress of Ireland. Assuming the truthfulness of the proverb—"There is a tide in the affairs of men which taken at the flood leads on to fortune," and that it is no less true of nations, Mr. Watson remarks that the tide in the affairs of Ireland is or soon will be at its flood, and that great industries teeming with wealth, and carrying with them a thousand satellites vital to the future of Ireland are now within reach. The population of Ireland has, he says, been more than decimated during even recent years, and that there has been and is still an influence at work fatal to the moral and material welfare of the people—an influence which no legislation has been able to check—and for which, though many able administrations have been ready to prescribe, none have yet prepared the antidote. In his opinion the remedy is now at the doors of the Irish people. No theoretical or sentimental grievances ever unpeopled a country, and every practical mind must see that the one great obstacle to the success of legislation for Ireland, however well intended, lies in her poverty. It is useless to admonish people how to live, so long as there is nothing to live upon, for the cry is still for bread—not the bread of charity, but the fruits of honest toil. It has always seemed to him that if the acknowledged resources of Ireland can once for all be thoroughly set in motion the wheel of industry will run merrily for many a long year.

With regard to general resources, he reminds us that the mineral wealth of Ireland is not by any means confined to iron—or is the iron ore by any means confined to Antrim. In county Down and elsewhere the existence of rich beds is now being reported. Coal measures of great value in many districts only await the application of a little of that energy and capital which have so long been withheld—lignite coal in large quantities and of known commercial value is to be seen in the North of Ireland—fire-clays and kindred deposits can be obtained in abundance; while the manufacture of peat fuel now bids fair to become a staple in the land, where the facilities for obtaining the raw material are superior to those of any other country. It is not difficult to anticipate—neither is it vain to hope—that there may, and will, follow in the wake of these developing resources what have followed in a hundred other great mining centres—blast-furnaces, railways, docks, harbours, and trades of every kind. There will be no longer a population whose very existence depends upon a single potato crop, but honest labour and good wages for all at home, and many more who are yearning to return to their native soil.

The county Antrim had for a long period been known to contain a fair description of brown hematite, but until the last two years no one appears to have suspected the enormous extent, richness, and value of these extraordinary deposits, owing to many of the shipments being carelessly sampled, the psilolite ore, or No. 1, being invariably mixed with the red bole and lithomarge. The result was that for several years the ore was only used as a flux for the rich hematites of Furness and West Cumberland, in the small proportions of about 10 per cent., whereas at the present time from 30 to 40 per cent. is the general proportion, and in some exceptional cases it has been smelted without any admixture of any other ores. Mr. Watson then goes on to point out the appearances of the various parts of the district which are worthy, commercially speaking, of more immediate attention, and observes that the ore-yielding ground thus rapidly sketched does not cover less than 140 square miles, and probably it will be found to be 200 square miles, as new discoveries are daily being made.

In conclusion, he very truly states that much remains to be done by those who are most capable of lending a helping hand. Landowners must waive their petty crochets and abandon much of their native obstinacy in persisting year by year that coal and iron do not exist, whilst some actually refuse to let their ground be tested. Irishmen must co-operate with English capital if they will not advance their own, and we must have more generosity and less grasping greed on the part of many who insist upon exorbitant claims for surface and other patrimonial damage, disturbance, or even inconvenience. Above all, let Irishmen forget the past, and hand in hand work together now at a moment critical in the annals of their country—work with that indomitable will which all acknowledge they possess—and they may rest assured that every noble effort now made will be seen soon upon good ground, the fruits of which will be reaped a hundredfold by a grateful posterity.

ROCK-DRILLING.—Mr. R. J. GOTTHEIL, engineer, of Chemnitz, has patented some improvements in rock-drilling apparatus. The invention relates to apparatus for drilling holes in rocks, such as blast holes. The apparatus consists of a drill attached to a spindle, mounted free, to rotate and move longitudinally in bearings, on a frame jointed so that the drill can be directed to any required angle. A wheel mounted on the framing has a cam shaped ratchet-teeth, which act on a pawl-lever. This pawl-lever bears against one edge of a clamping ring encircling the drill-spindle, and a volute helical spring bears against the opposite edge of the ring. The ring, when pressed backwards by the pawl-lever, is caused, so as to nip the drill-spindle, and to draw it back and twist it a little round. When the pawl escapes a tooth the spring drives the spindle forward, and thus the successive teeth, as the wheel is made to revolve, cause the drill to make a succession of blows, which have the effect of drilling a hole, the drill being at the same time turned and advanced a little, as in hand-boring.

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HOLLOWAY'S PILLS—NERVOUS DEBILITY.—"No part of the human machine requires more watching than the nervous system, upon which health and life itself depend. These pills are the best regulators and strengtheners of the nerves, and the safest general purifiers. Nausea, headache, giddiness, numbness, and mental apathy yield to them. They displace in a summary manner those distressing dyspeptic symptoms, stomachic pains, fulness at the pit of the stomach, abdominal distention, and regulate alike capricious appetites and confined bowels—the commonly accompanying signs of defective or deranged nervous power. Holloway's pills are particularly recommended to persons of studious and sedentary habits, who gradually sink into a nervous and debilitated state, unless some such restorative be occasionally taken."

FOREIGN MINING AND METALLURGY.

The Paris copper market has been quiet, and without much business. The offers made by holders impart to it still more feebleness, and in consequence all descriptions of metals have been drooping. Quotations, with delivery at Havre, have been as follows:—Chilian in bars, 88 $\frac{1}{2}$; ditto in ingots, 94 $\frac{1}{2}$; tough English, 92 $\frac{1}{2}$; and Corocoro minerals (pure copper), 89 $\frac{1}{2}$ per ton. Although the demand for copper has somewhat increased in Germany, affairs may still be said to lack animation. Tin has experienced a fresh advance at Rotterdam. From 71 fls. Banca advanced in succession to 72 $\frac{1}{2}$ fls. and 73 fls., but the last advices state that at the sale of the Society of Commerce 20,800 ingots of Banca only realised 70 $\frac{1}{2}$ fls. Billiton tin has been quoted at 69 $\frac{1}{2}$ fls. to 69 $\frac{1}{4}$ fls. There has been no great amount of business passing in tin at Paris, and prices have been drooping; Banca, delivered at Havre or Paris, has made 128 $\frac{1}{2}$ per ton, and English, delivered at Havre or Rouen, 124 $\frac{1}{2}$ per ton. At Marseilles tin has also been feeble. A similar report may be made as to the German tin markets. The troubles of which Carthage and the neighbourhood have recently been the theatre have tended to strengthen prices, as the production of that important district has been greatly reduced by the recent course of events. The Paris lead market has been almost colourless. French lead has made 23 $\frac{1}{2}$ ls.; Spanish, delivered at Havre, 23 $\frac{1}{2}$ ls.; English, 23 $\frac{1}{2}$ ls.; and Belgian and German, delivered at Paris, 23 $\frac{1}{2}$ ls. per ton. Zinc has been rather feeble; Silesian, delivered at Havre, has made 27 $\frac{1}{2}$ ls. per ton; and other good marks, delivered at Havre, 27 $\frac{1}{2}$ ls. per ton.

The last few days have formed a very dull period in the Belgian iron trade. Some small contracts for rails have been, however, concluded, and some orders for plates have come to hand from France, Holland, and even from England. Some few orders have also been given out from the interior for merchants' iron. Merchants' iron has remained quoted at 8 $\frac{1}{2}$ ls. 6s. per ton, while refining pig has made 3 $\frac{1}{2}$ ls. 6s. to 4 $\frac{1}{2}$ per ton, and casting pig 5 $\frac{1}{2}$ ls. 4s. per ton. Plates have realised about 11 $\frac{1}{2}$ ls. 4s. per ton. The difficulty which is experienced in obtaining an outlet for Belgian products, notwithstanding that Belgian quotations are generally lower, seems to indicate a fixed resolution on the part of those countries not to lay in supplies in Belgium unless their own works are absolutely unable to furnish the supplies indispensably required. Under these circumstances, Belgian industrialists will have to seek for outlets for their products in more remote parts of the world, such as America and Asia. Belgian manufacturers of railway plant are at present to a great extent without work, and those who still have employment regard with some apprehension an early future, in which they fear that orders now in course of execution will become exhausted. They are awaiting with something like feverish impatience the orders for trucks which have been promised to them by the Belgian Minister of Public Works, but which have not yet been given out. The Ougrée Ironworks Company has obtained official authority to establish four new puddling furnaces and 10 re-heating furnaces, so that it will now be enabled to further extend its production.

No important fact calls for notice in the Belgian coal trade, except that the fall in prices is extending, and becoming more general. If there is a difference of opinion as to the causes of the reduction there is a general agreement as to the effects, and everyone is obliged to admit that there are scarcely any transactions, that prices are badly supported, and that any hopes entertained as to a recovery in quotations repose on a very weak foundation. In the Charleroi basin miscellaneous coal has been obtainable recently at 18s. 4d. per ton. Coking coal has fallen to 16s. per ton, and is still drooping. Coke remains in a depressed state in Belgium, and it will not revive until the metallurgical interest also recovers itself to some extent. All the coke ovens which could well be put out have been extinguished, and the others have been accumulating stocks. This growth of stocks has accelerated the reaction in prices. All domestic quantities of coal have been a good deal neglected in Belgium, and a reduction of 3s. per ton has been freely consented to as regards current prices, which are, for the rest, extremely vague. Upon the whole, there has been a general fall in all descriptions of coal in Belgium, but the reduction has been more general at Liège than at Charleroi, because at Liège metallurgical industry exerts a greater influence. The Charleroi Coal Trade Association has revised its statutes and re-elected its committee; M. Stainier has also been continued in office as secretary. The Produits Colliers Company will pay March 2 a dividend for 1873 at the rate of 48 $\frac{1}{2}$ per share.

The Foundries and Forges Co., of Besseges and Terre Noire la Voulte, France, have introduced a new and improved furnace and process for the manufacture of metallic alloys. Ores containing tungsten, titanium, or manganese, separately or in any required combination or quartz, all finely pulverised and commingled in suitable proportions, are to be mixed with scraps of cast-iron or steel, in a nearly uniform state of division, such as iron filings, iron turnings, or wrought-iron, cast-iron or steel, granulated or pulverised, or spongy iron, and the whole to be reduced in a special furnace. For the construction of the cupola very hard fire-bricks, containing a large quantity of alumina in their composition, are employed, the boshes being constructed of pure alumina, of magnesite, or of lime, and the crucible or hearth of carbon, lime, or magnesite. When made of carbon the crucible is constructed in one piece, by moulding a mixture of tar with pure graphite, gas-coal, or pure coke, in a strong sheet-iron box, the whole being well closed up, and heated for a few hours to a dark red heat, whereby a very hard and compact mass is obtained. This looks sufficiently promising, although the merit of originality can scarcely be claimed either for the commingling and commingling of the materials, or for the introduction of tungsten, titanium, or manganese in iron alloys.

The French coal trade has continued quiet, and prices have been persistently falling, while the demand has also fallen off. The prices which yet prevail are still, however, highly remunerative, and the aspect of affairs would be tolerably satisfactory if the future were not beset with apprehensions. The Paris coal market, in which speculation prevails to the greatest extent, has been the most affected. Substantial concessions have been made, but the fall in prices has not been sufficient to bring orders; buyers maintain, in fact, a defensive attitude, and feel the necessity of enforcing sacrifices on the part of coalowners to the utmost possible extent. The fine time which coalowners have had of late is not likely to be soon witnessed again. The vigorous impetus which has been given to production will be the first obstacle in the way. In this respect the basin of the Pas-de-Calais has made more progress during the last two years than in the previous decade. It is stated that the committee of French coalowners will not issue this year its usual report as to the production of the French coal mining interest. If this statement is correct it is much to be regretted, as the information in question would be especially interesting just now. It is estimated unofficially that the production of coal in France in 1873 was about 16,500,000 tons, or some 2,000,000 tons more than in 1872. In the St. Etienne basin there has been no avowed reduction, but prices are not so firm, and the reaction experienced in other markets begins to make itself felt.

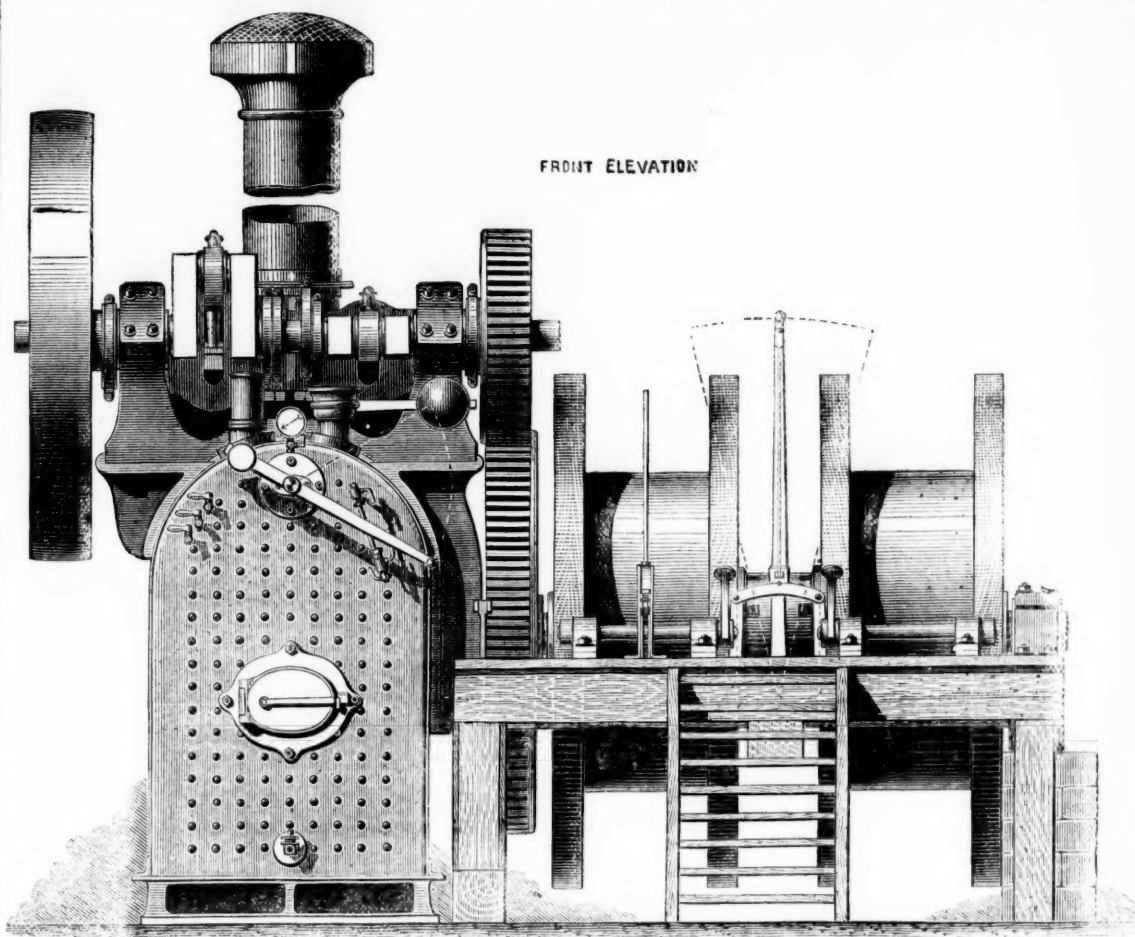
The stagnation in the Belgian iron trade is being prolonged in a manner which threatens to exert a serious influence upon quotations, which have become weaker, and in some cases have even exhibited a rather decided downward movement. In the Meurthe-et-Moselle white pig for refining has fallen to an average of 77.9s. per ton. In the Champagne group the price of rolled iron from coke-made pig is 10 $\frac{1}{2}$ ls. 8s. per ton, and that of rolled iron from charcoal-made pig 11 $\frac{1}{2}$ ls. 12s. per ton. Puddled construction plates have made from 14 $\frac{1}{2}$ ls. to 15 $\frac{1}{2}$ ls. 8s. per ton. No. 1 coke-made pig has been quoted at 6 $\frac{1}{2}$ ls. 8s. per ton, while No. 2 has brought 5 $\frac{1}{2}$ ls. 8s. per ton. The works of the Nord are asking 10 $\frac{1}{2}$ per ton for merchants' iron. The works of the South of France are executing orders for the United States—a quarter of the world with which the French iron trade appears to be extending its commercial relations.

A letter from Essen (Rhenish Prussia) states that stagnation in the local iron trade and a mild winter have brought about a reduction in the price of coal. Most of the local collieries had concluded contracts for the disposal of the greater part of their production before the close of the autumn, and at the highest rates. But, some establishments having now partially blown out their furnaces they

receive more coal than they can consume, and their managers are accordingly seeking to re-sell what they cannot use, even at a loss. Coal merchants also find themselves embarrassed with a certain ac-

cumulation of stocks, in consequence of the absence of a sufficient demand, and all these circumstances have a tendency to increase the downward movement in prices.

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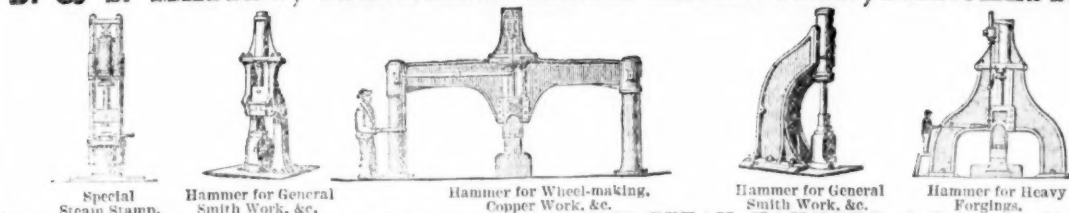
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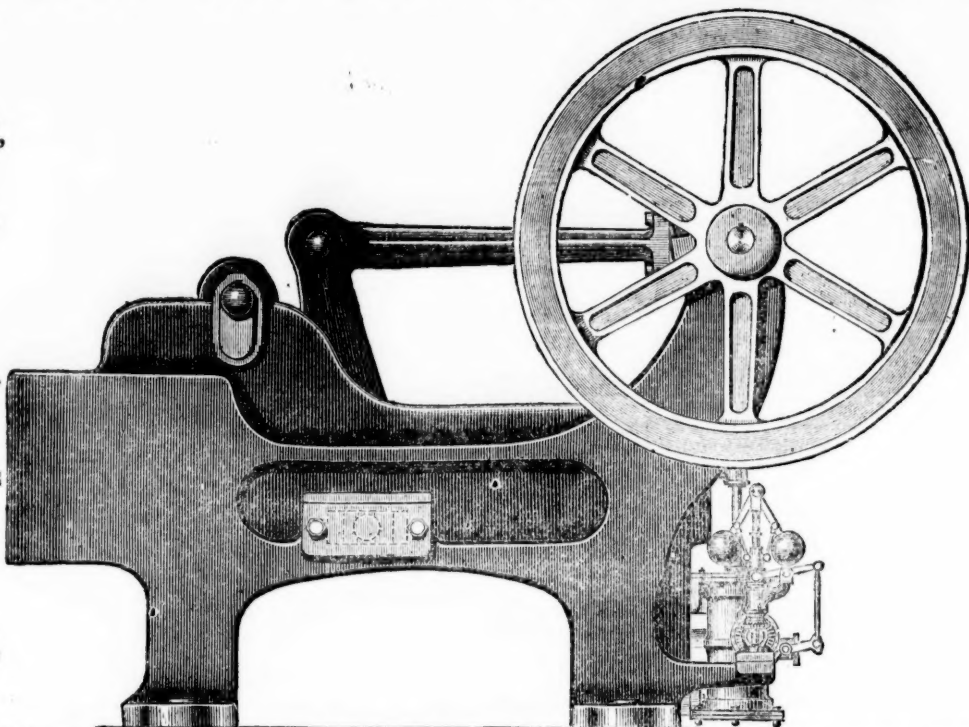
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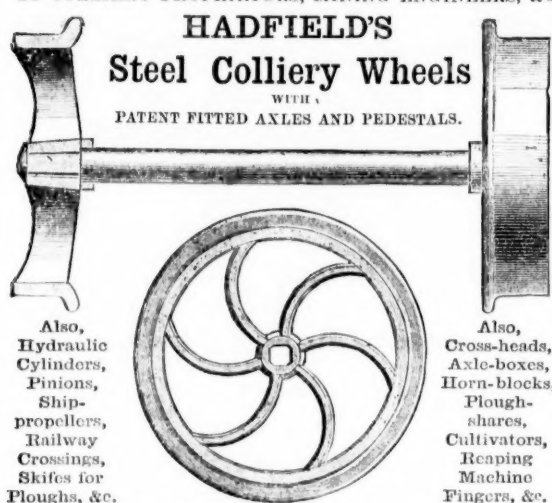
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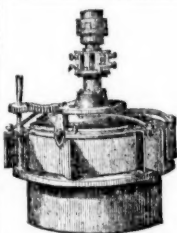
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